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# **FINAL EVALUATION OF THE INTEGRATED PEST MANAGEMENT PROJECT IN THE DOMINICAN REPUBLIC**

**LC 2.07 P-B**

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## Acronyms and Abbreviations

AMAP	Asociación de Mujeres de Acción y Progreso
BT	<i>Bacillus thuringiensis</i>
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza
DR	Dominican Republic
EAP	Escuela Agrícola Panamericana
EPA	Environmental Protection Agency, U.S.
FAO	Food and Agriculture Organization
FDA	Fundación de Desarrollo Agropecuario
GIFAP	Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IICA	Instituto Interamericano de Cooperación en la Agricultura
INFOTEP	Instituto de Formación Técnico Profesional
INRHI	Instituto Nacional de Recursos Hídricos
IPM	Integrated Pest Management
ISA	Instituto Superior de Agricultura
JAD	Junta Agroempresarial Dominicana
MUDE	Mujeres en Desarrollo
NGO	Non Governmental Organization
NPV	Nuclear polyhedrosis virus
PVO	Private Voluntary Organization
SEA	Secretaría de Estado de Agricultura
UASD	Universidad Autónoma de Santo Domingo
USAID	U.S. Agency for International Development
USDA	United States Department of Agriculture
U.S.FDA	U.S. Food and Drug Administration
TYLCV	Tomato yellow leaf curl virus
WHO	World Health Organization

# EVALUATION OF THE INTEGRATED PEST MANAGEMENT PROJECT IN THE DOMINICAN REPUBLIC

## 1.0 Executive Summary

The IPM project in the Dominican Republic was subject to a final evaluation from August 29 through September 13, 1994. During this time, the evaluator visited all main project implementation sites and interviewed at least 75 farmers, agribusiness leaders, and agronomists, individually and in groups. This report outlines the findings, conclusions, and recommendations of that evaluation.

The IPM project compares favorably with similar present and past projects in Latin America, and can be considered a first-rate and successful project. Working in an adverse and even hostile environment, the project personnel have exceeded the projects initial objectives in a relatively short-time. By providing answers to complex and often baffling crop protection problems, offering cost-effective, environmentally friendly IPM alternatives, it has won the respect and support of the agroindustry community and the public sector. Much of its success is due to the enthusiasm and dedication of its staff. This project has succeeded in introducing IPM approaches in target crop production systems, which will significantly alter the traditional dependance on pesticide use in favor of more cost-effective and environmentally-sound techniques. This evaluation advances the following conclusions.

The project has been successful in finding short-term solutions to its target pest problems, by initiating the search for long-term solutions, and by contributing to the significant reduction of pesticide applications against several target pests.

The project's IPM training and transfer activities have been remarkably successful in promoting the understanding and adoption of IPM practices in target crops in project implementation areas.

One of the more effective tools proposed and implemented by the project to help reduce whitefly infestations has been the enactment of mandatory whitefly host crop-free periods. However, enforcement of this regulation, including destruction of illicit crops, is not an appropriate role for this project.

Project support, respect, and credibility in the agribusiness community is quite high in each of the four regions where it has been active.

The project does not function in isolation, but works in close collaboration with farmers and farmer associations, agribusiness enterprises, universities and training centers, NGOs, the public sector, and international research organizations.

The project impact on women, including women's participation in project activities, as well as its impact on the rural poor and its contribution to poverty alleviation has been somewhat limited. This, in part, reflects the project's primarily technical design and its concentration on pests and crops.

The project appears to have had a positive environmental impact in target areas in that it has succeeded to encourage the reduction of pesticide use in major crops, including tomatoes and other vegetable crops.

The following are recommendations provided by this evaluation (pages 19-24). 1) There should be a second phase for this project. 2) The project should become self-sustaining at the end of its second phase. 3) The project must re-examine and sharpen its research focus. 4) At least 75% of the project should be devoted to extension and training. 5) The project needs to develop and implement a documentation strategy. 6) The project needs to target more women in its outreach programs. 7) The project should include a pesticide management/ safety program. 8) The project should stay away from regulatory functions involving crop destruction. 9) Prior to embarking in a second phase, the project needs to host a nation-wide informative workshop, which is to be followed by a planning workshop. 10) Any plans for a second phase of this project must include provisions for a mid-term evaluation. 11) Current project monitoring mechanisms should be maintained by future funding agencies during a second phase of this project. 11) There should be ongoing training and salary compensation for project staff.

## 2.0 Introduction

Since 1990, USAID/DR has supported the implementation of the Integrated Pest Management (IPM) Project in the Dominican Republic. This project was designed with the primary purpose of finding short and long-term solutions to the evolving pest and pesticide problems that have seriously affected this country's agriculture in recent years, such as those originated by whiteflies and a newly-arrived thrips species. The project is implemented by the Junta Agroempresarial Dominicana (JAD) and the Fundación de Desarrollo Agropecuario (FDA) in collaboration with the Secretaría de Estado de Agricultura (SEA). Main project activities include farmer-responsive research, extension, and training in four geographic regions. The training and extension components were designed to flow directly from research activities to assure prompt dissemination of IPM methodologies to farmers.

The purpose of this evaluation is to assess the project impact on agricultural production, the environment, and farmer income in the project target areas, as well as the degree of project achievements at the end of its fourth year of implementation. Furthermore, this evaluation aims at determining how well the project has met its objectives, as defined above and in the Project Paper, and at identifying intervening impediments, if any. Conclusions and recommendations are provided wherever deemed necessary.

## 3.0 Background

Agriculture in the Dominican Republic has experienced severe drawbacks in recent years, much of it due to the combined and interlocking effects of new pest problems and excessive pesticide use. In 1988, attacks by the sweet potato whitefly, *Bemisia tabaci*, virtually exploded in the Azua Valley. In that same year, *Thrips palmi* was reported for the first time in the country. In the Constanza Valley, the greenhouse whitefly, *Trialeurodes vaporariorum*, became unusually abundant. In 1991, viruses transmitted by the whitefly to

tomatoes and other cultivated and wild hosts complicated the crop/pest relationships and seriously affected the tomato industry. By far, the more serious of these is the Tomato Yellow Leaf Curl Virus (TYLCV). Once a tomato plant is infected with this virus, it stops setting fruit. Of the two species of whiteflies affecting local agriculture, only *B. tabaci* is implicated in the transmission of the TYLCV virus to tomatoes in the Azua and San José de Ocoa valleys. Even in the absence of viruses, large populations of whiteflies can seriously damage host crops (e.g. tomatoes) through their feeding activities and the secretion of sticky honeydew, which in turn promotes the growth of sooty mold. However, as virus vectors, relatively low populations of whiteflies are capable of infecting entire host crop plantations. In the Dominican Republic, whiteflies attack tomatoes, melons and other cucurbits, beans, egg plant, and various vegetable crops. The newly-arrived thrips seriously affected specialty Chinese vegetables in La Vega. This led to intensified pesticide applications, which in turn contributed to more rejections of shipments by the Food and Drug Administration (FDA) due to illegal pesticide residues. Estimated cumulative losses due to rejected shipments during 1989-92 exceed U.S. \$40 million. Since then, the severity of *T. palmi* attacks has subsided, but the virus-whitefly problem has spread throughout much of the country and remains unabated.

During April-May of 1989, several workshops were held in the DR, for the purpose of formulating strategies for dealing with whitefly problems affecting the cultivation of tomatoes and other vegetable crops in the Azua Valley. It was through the "Proyecto Control Integrado Mosca Blanca," to be implemented by the Comisión de Estudio, that the Prevención y Control de Mosca Blanca was conceived. Its proposed research and extension actions targeted the use of mineral oils, neem extracts, trap crops, natural enemies, and other IPM techniques as whitefly management tools.

The implementation of the IPM Project in the Dominican Republic began in 1990 as a response to the worsening pest and pesticide problems. The project technical staff were recruited and the project vehicles obtained during late 1990 - early 1991. Three of the proposed four regional centers were also created in 1991 in the following locations: Azua (South-Southeast Region), La Vega (North-Central Region), and Santiago (North-Northwest). The fourth, in Hato Mayor (East Region) was added in 1993. In addition, demonstration plots were established in these and other locations (See table below). Each center was staffed with three crop protectionists, and the project was consolidated during the first half of 1991. Project staff began to receive training in IPM and pesticide management during these early stages of project implementation.

In 1991, two IPM specialists from the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) evaluated the project and recommended several modifications, which included targeting fewer pest and crop objectives. As a result, the project narrowed its focus in both respects concentrating on *T. palmi*, the sweet potato whitefly, *Bemisia tabaci*, the potato tuberworm, *Phthorimaea operculella*, and the diamondback moth, *Plutella xylostella* in only tomato, potato, bean, tobacco, chinese vegetable, and cabbage crops.

Through collaborative agreements, project support is now provided by the Instituto Superior de Agricultura in Santiago, Instituto Agrícola Salesiano in La Vega, and the Centro

de Investigaciones Agropecuarias en la Zona Arida, in Azua. Project activities at each center are planned in collaboration with and under the supervision of a Consejo Regional, comprised of producers, SAE, Banco Agrícola, and the Instituto Nacional de Recursos Hidráulicos (INRHI). The Consejos meet frequently to monitor project activities and provide official support for the enforcement of certain IPM practices, such as regulation of planting dates and destruction of unauthorized crops. An agreement signed among JAD, FDA, and SEA encourages SEA to adopt policies that are consistent with project recommendations. The project also collaborates with several institutions, including INDHRI, the Banco Agrícola, the Universidad Autónoma de Santo Domingo, the Instituto Superior de Agricultura, the Instituto Agrícola Salesiano, and many others. The IPM project validates and transfers management methodologies through demonstration plots, field days, technical assistance activities, and workshops as soon as these are validated and adapted in farmer's fields.

**Table 1. Project regional centers, validation plots, and biocontrol labs at the time of this evaluation**

	Regional Centers	Validation Plots	Biocontrol Labs
Azua	X	X	n/a
Santiago	X	n/a	n/a
La Vega	X	n/a	n/a
Hato Mayor	X	X	X
Constanza (sub-regional)	X	X	n/a
San José de Ocoa	n/a	X	X
Navarrete	n/a	X	n/a
Cerro Gordo	n/a	X	n/a
San Juan de la Maguana	n/a	X	n/a
Gozuela	n/a	X	n/a
Tambori	n/a	X	n/a
Lisey al Medio	n/a	X	n/a

#### **4.0 Status of Project Activities**

The IPM Project is implemented by a team of 14 crop protectionists, distributed as follows: two in Hato Mayor, three in Azua, two in La Vega, three in Constanza, four in Santiago, and one in Santo Domingo. In addition, two specialists from JAD's diagnostic

laboratory function as informal members of the IPM team and collaborate closely with them in most aspects of project implementation. The project also contracts personnel on a temporary basis, as needed. The IPM project is staffed by crop protectionists at the Agronomo and Ing. Agronomo level. All have received short-term training in IPM, pesticide management, and biocontrol. At least two individuals, the project coordinator and the regional coordinator in Hato Mayor, received medium-term training in biological control techniques in Barbados and Germany before joining the project. Another staff member has an M.S. degree in IPM from CATIE. Project objectives, including crops and pests targeted, are defined on a regional basis in collaboration with each Consejo Regional.

Table 2. Main target crops in each IPM Project regional center

Regional Center	Crops
Azua	Azua valley: industrial tomatoes; San José de Ocoa: fresh market tomatoes
Santiago	Industrial tomatoes, tobacco, melons, sweet potatoes, avocado
La Vega	Chinese vegetables, including green beans and several cucurbits; sweet potatoes
Constanza	Potatoes, cabbage, beans
Hato Mayor	Citrus

#### 4.1 South-Southwestern Region: Azua, San Jose de Ocoa

In this region, IPM project efforts are dedicated almost entirely to whitefly and virus problems affecting tomatoes, potatoes, and sweet potatoes. The Azua valley produces most of the country's industrial tomatoes. Conversely, this is the most important crop in this valley and the main crop grown by almost 4,000 producers. At present, there are still three tomato-processing companies that oversee the production and assure a market for industrial tomatoes grown here. Three other such companies were forced to close their operations in the recent past due to the severity of pest problems. The IPM project in Azua directs most of its training efforts to agroindustry extensionists who oversee the production process. These, in turn, transfer IPM recommendations directly to growers, in a multiplicative fashion.

Tomato production has been seriously affected by whitefly-transmitted viruses in Azua, San José de Ocoa, and several other localities in the Dominican Republic. Producers report that losses due to viral infection were responsible for reducing industrial tomato production in Azua, from about 40 metric tons/ha before 1988 to 9.6 metric tons/ha in 1993-94. Another version of losses cite pre-1988 production figures of 24 metric tons/ha and 8 metric tons/ha at present. It is also reported that industrial tomato production decreased from 1,770 metric tons and 8,437 ha planted in 1988 to 1,113 metric tons and 3,361 ha in 1991.

Once the tomato plant is infected, it ceases to set fruit. If seedlings are infected in the nursery or shortly after transplant, production will be negligible. If the plant is infected after it has partially set fruit, it will produce a yield equal to the fruits that were set before infection took place. If the plant is infected after its full fruit load is set, its yield will not be affected. That is why the plant protection strategy against the TYLCV virus is to delay the onset of infection as much as possible. Unfortunately, this may mean continuous -- often daily -- pesticide applications, to destroy the whitefly vector before it has the chance to transmit the virus, which in turn leads to unacceptable environmental, health, and economical consequences. Before the intervention of the IPM Project, calendarized applications of the more toxic ("red label") insecticides were being applied for this purpose in this and other tomato producing areas.

Fresh market tomatoes are produced in San José de Ocoa and other localities where whitefly and virus damage has also brought this crop near collapse. For example, at least one farmer, who owns 18.75 ha in this valley, has decided against growing tomatoes this year due to unacceptable pest damage and cost of chemical control, and has turned instead to farming beans, onions, and cabbage, which leave little profits. A second farmer tried a Cuban seed tomato variety, presumably tolerant to the virus, but the crop still suffered serious damage and had to be plowed under. Production of fresh market tomatoes in this area has decreased from 500-600 ha before the whitefly/virus crisis to about 20 ha at present. Prices are high and people have learned to consume less tomatoes.

Support of producers for the project is quite high. Most seem committed to continue farming industrial tomatoes in spite of pest problems, partially because this is the only local crop that has a guaranteed market. The IPM project is acting as a catalyst to generate interest in IPM and has provided the tomato producers with a united front against pest problems. To understand this phenomenon, it is necessary to realize that before the project's intervention, farmers were bewildered by the new pest problems, which led them to blindly try a wide range of pesticides in a futile effort to control the whiteflies. During its first two years or so, the project had to work hard at convincing farmers that it had something to offer. The project staff had to overcome initial distrust and reluctance to accept their explanation of the pest/crop interactions and proposed course of action through an intensive IPM awareness and training program.

#### **4.2 North-Central Region: La Vega, Constanza**

This is the only project regional center that also includes a subregional center, located in the Constanza valley. In contrast to Azua and Santiago, where the project staff work mainly with well-organized agroindustry associations, those in the North-Central Region deal directly with individual farmers.

Main project crops in La Vega are sweet potatoes and Chinese vegetables, including green beans and various cucurbits. It is here where *T. palmi* was first reported in the Dominican Republic. In Jarabacoa, the project provides limited assistance to several producers of Chinese vegetables, fresh market tomatoes, and flowers. The Constanza valley is a major producer of a wide range of crops, including carrots, garlic, cabbage, potatoes, and

beans. Project efforts here are focused on a pilot area that includes 60 farmers and 75 ha of cultivated land. Project target crops and pests in the Constanza valley are: potato tuberworm, diamondback moth on cabbage, and the greenhouse whitefly, which is reportedly causing up to 60% loss in beans. The project has also assisted successfully with the control of the Indian Meal Moth on stored garlic, using pheromone traps and sanitation in collaborating warehouses.

The Constanza valley is well known for its agriculture that has traditionally relied on intensive pesticide use, which appears to have caused substantial environmental degradation and health problems over the years. There is no documentation on specific impact of short or long-term pesticide use, and much of the analysis of pesticide-related problems remain anecdotal. Characteristic of this valley is the unusual abundance of the greenhouse whitefly, whose adult members can be seen flying virtually everywhere in large numbers.

In Azua and La Vega, the project has aggressively promoted, through extension and training programs, the implementation of some IPM practices, with marked success. Among the techniques promoted and adopted by many farmers here, are: a) the use of pheromone traps to help reduce populations of the sweet potato weevil, potato tuberworm, and the Indian meal moth; b) the use of action thresholds (based on the monitoring of insect pest populations) for applying pesticides; c) the promotion of "softer" pesticides, including soaps, oils, and microbial insecticides such as commercial preparations of *Bacillus thuringiensis*; d) conservation of biological control organisms through the use of selective pesticides and the planting of corn rows along commercial fields (these, along with the pheromone traps, are becoming ubiquitous in these parts); e) awareness of the potential adverse effects involved in the use of highly toxic pesticides. There is no precise data on adoption rates yet, though cursory observations conducted during this evaluation suggest that the adoption rate for some IPM techniques, such as the use of pheromone traps and the abandonment of routine, calendarized pesticide applications in favor of using crude action thresholds to determine when to apply, probably exceeds 50% in project pilot areas.

Although there is no baseline information that can be used to assess the IPM project's environmental impact in the Constanza valley, the following observations, advanced to that end, suggest that a partial ecological recovery may be underway. At the time of this evaluation, several flocks of white egrets were observed and photographed in fields, including some which were following a tractor tillage operation to feed on insect larvae being exposed. Reportedly, these birds had not been seen in the valley for years. It was also observed that several well known predaceous insects were present on weeds and maize -- the latter expressly planted by farmers along borders of commercial fields to attract such insects -- including wasps (*Polistes* sp.), lacewings (*Chrysoperla* sp.), assassin bugs (*Zelus* sp.), and ladybird beetles (*Coccinella sanguinea*), some of which were locally abundant. On the other hand, spiders seemed to be unusually scarce. Spiders, in general, constitute a major component of the predatory arthropod fauna in most agroecosystems. Their numbers and diversity tend to dwindle in areas subject to intense pesticide pressure. Their relative sensitivity to pesticides makes them suitable ecological indicators of pesticide contamination.

#### 4.3 North-Northwestern Region: Santiago, Navarrete

Project efforts (about 60%) at this center are mainly oriented to industrial tomatoes and tobacco (20%). The remaining 20% of efforts are directed to melons and other cucurbits, sweet potato, avocados, chili peppers, and other minor crops. As in Azua, the main tomato pests in this region are whiteflies and geminiviruses. Other key pests include the sweet potato weevil and the avocado lace bug. In addition to being a whitefly and TYLCV virus host, tobacco in this region is attacked by the tobacco hornworm, *Manduca* sp., noctuid moths, *Heliothis* spp., and aphids, *Mysus* sp.

At this location, the Instituto Superior de Agricultura (ISA), in collaboration with the IPM project and the support of the Transagricola tomato growers association, has been characterizing the local host range for the sweet potato whitefly, *B. tabaci* and the TYLCV virus. To date, over 50 plant species and varieties have been tested, and so far only tomato and tobacco cultivars, as well as *Datura* sp., a wild plant, all in the family Solanaceae, have been confirmed as virus hosts.

As in Azua, IPM recommendations for *B. tabaci* and virus control in this region include the implementation of mandatory crop-free periods (veda) for tomato and tobacco (virus hosts) and for *B. tabaci* hosts, such as egg plant and melons, as well as recommendation for the local eradication of the weed *Datura* sp. Tobacco producers here are well organized, respond readily to IPM recommendations, collaborate fully with the "veda," and are a source of local support for the IPM project.

In those collaborating farms which have adopted IPM recommendations in some degree, the average number of pesticide applications per season has been sharply reduced from 12 to three in tobacco, 12 to four in tomatoes, and 15 to six in avocados. In terms of the overall IPM experience worldwide, where the elimination of even a single pesticide application per season would be considered a significant achievement, these gains are indeed dramatic. Savings in chemical crop protection costs, i.e. savings resulting from cutting down expensive pesticide applications, are likewise estimated as 67% for tomatoes, 75% for tobacco, 60% for melons, and 70% for avocados, based on chemical pest control costs before the adoption of IPM recommendations. As in the other regions where the project is operating, agroindustry support is remarkably high here.

#### 4.4 Eastern Region: Hato Mayor

This region includes approximately 10,670 ha of citrus plantations which are mainly oranges, grapefruit, tangerines, and lemons. Most citrus growers here are organized under three major associations. The main citrus insect pest in Hato Mayor is at present *Diaprepes abbreviatus*, a weevil that in its larval stage attacks the roots of citrus trees, seriously damaging or even killing them. Adults are also minor pests of citrus fruit. In the past, farmers have applied an assortment of insecticides in an unsuccessful attempt to control this pest. The blossom blight is the main citrus disease in this region, but it can be controlled with the fungicides captan and benomyl. Two recent arrivals, the leafminer, *Phyllocnistis citrella* and the aphid *Toxoptera citricidus* have added to the concerns to the citrus industry.

here. The aphid is of special concern since in other regions it is the main vector of the citrus tristeza virus, which if unchecked could decimate susceptible citrus cultivars. Apparently, this virus is not present in the Dominican Republic.

As with the tomato agroindustry in Azua and the sweet potato farmers of La Vega, the citrus industry here is highly supportive of the IPM project and credits it with bringing into the area a rational approach to pest control. Prior to the arrival of the local IPM project coordinator, the citrus weevil infestation, in particular, led to growers spraying pesticides with little or no guidance. Most pesticides applied were totally ineffective against the weevil because of the subterranean habits of its immature stages. Soon after the IPM project opened its fourth regional office in Hato Mayor, the coordinator convinced the growers of the futility of this practice, introduced the IPM concept into this region, and began to explore biological control options. At present, the local citrus industry is showing much interest in IPM, as expressed by leaders of citrus organizations interviewed and demonstrated by the citrus growers' financial contribution, in equipment and materials, to the IPM project's biocontrol laboratory in Hato Mayor. The citrus industry has also recently financed the visit of two citrus pest management specialists from the University of Florida to help assess the potential impact of a newly-arrived leaf mining insect, which attacks citrus crops, and provide recommendations for its management.

This center operates a small biocontrol facility that is rearing the parasitic wasp *Tetrastichus haitiensis* and the nematode *Heterorhabditis* sp. for release against the citrus weevil. Resident beneficial insect populations are at times decimated by pesticide applications, and the project is using its rearing facilities to periodically re-introduce beneficial species. Several species of ants and spiders may be contributing to the natural control of the weevil. During the evaluation, we observed ant predation on weevil larvae in the field, involving two different ant species. The regional IPM office also keeps a registry for each farm in the area, that includes detailed information on pest problems and pesticide applications.

## 5.0 Major Findings and Conclusions

### 5.1 Research

About 25% of project resources have been dedicated to applied research. Most research activities have been of the "quick and dirty" type, mainly validation tests carried out in farmers fields. The purpose of this approach has been to optimize the utilization of scarce project human resources and to expedite the transfer of promising results to farmers. The following are examples of short-term research activities conducted by the project, the results of which have led to the formulation of IPM recommendations:

- Validation of whitefly *Bemisia tabaci* and geminiviruses management techniques on tomatoes, including (a) establishing crude action thresholds, (b) testing for effectiveness of various "soft" pesticides such as oils, soaps, and microbial insecticides, such as BT products; (c) testing for the effects of planting maize rows along the borders of commercial fields to encourage the build up of natural enemies; (d) testing for tolerance to tomato yellow leaf curl

(TYLCV) virus in tomato varieties; and monitoring of whitefly populations on numerous plant hosts;

- IPM validation tests for the diamondback moth, *Plutella xylostella* on cabbage;
- Testing the effectiveness of pheromone traps to monitor and manage populations of the potato tuberworm, *Phthorimaea operculella*;
- Testing the effectiveness of pheromone traps to monitor and manage populations of the sweet potato weevil, *Cylas formicarius*;
- Testing the effectiveness of nuclear polyhedrosis virus (NPV) preparations in controlling potato tuberworm infestations in stored seed potato;
- Testing the effectiveness of controlled releases of the nematode *Heterorhabditis* sp. and the parasitic wasp *Tetrastichus haitensis* for the biological control of the weevil *Diaprepes abbreviatus* on citrus crops;
- Validating action thresholds and testing the effectiveness of soaps and oils against each of the key insect pests targeted under the project.

Considering that this project was not fully staffed until early 1991, that it was to deal with unusually serious pest and pesticide use problems, and that it was not really designed as a research unit, this project has been remarkably effective in finding short-term solutions to its target pest problems and in initiating the search for long-term solutions for them.

By concentrating on promising and viable validation research objectives, the project has been able to rapidly identify short-term solutions for several pest problems, such as the sweet potato weevil, potato tuberworm, citrus weevil, and Indian meal moth. Its work has also contributed to the significant reduction of pesticide applications against other pests, such as the diamondback moth, avocado lace bug, and greenhouse whitefly.

In the case of whitefly and virus problems on tomatoes, the project is introducing IPM practices that enable producers to save about 70% of their chemical control costs. A recent study on the potential economic impact of the IPM project estimates that assuming an area of about 5,500 ha planted to tomatoes and an IPM adoption rate among producers of 60-75%, chemical control savings of about RD \$9-10 million per planting season. Similar potential savings estimates for sweet potatoes and cabbage are RD \$ 395,000-494,000 and RD \$1.2-1.5 million, respectively (see Appendix 1).

The project has also contributed to the understanding of the interaction between the sweet potato whitefly, associated geminiviruses, and their host plants. This, in turn, has led to formulation and implementation of IPM strategies for dealing with these pests, which have severely affected the tomato agroindustry in this country.

The *T. palmi* outbreak, which affected mainly Chinese vegetables grown for export to the U.S. in the DR, has subsided in the past two years. Although the project cannot take full credit for this occurrence, which appears to have been driven -- in part -- by natural events, it probably contributed to this outcome through its initial research efforts that emphasized reduced pesticide use and the conservation of potential natural enemies of the thrips. In addition, the project recommended full irrigation to drown the pupal stage of this the thrips, which is found in the soil. Shortly after arrival in the DR, *T. palmi* populations probably exploded in certain crops, such as Chinese vegetables, as this insect found itself with few of the natural enemies that normally keep it in check in other regions. Chinese vegetables were already being heavily sprayed with pesticides by farmers who were trying to control whiteflies, which then eliminated insect predators that might have fed on the thrips. When chemical control efforts proved unsuccessful, many farmers simply ceased to grow Chinese vegetables. Others adopted the project's recommendations. The combined result was probably a combination of less food availability for the thrips and a drastic decrease in pesticide applications. Leading to the return the of natural enemies and which could control the thrips as nature planned it.

Table 3. Project target pests, affected crops, and main IPM techniques validated and recommended by project

Key Pests	Main Crops Affected	IPM Techniques Validated
Sweet potato whitefly, <i>Bemisia tabaci</i>	Tomatoes, potatoes, egg plant, tobacco, beans; melons, cucumbers and other cucurbits	Crop-free period, wild host removal, soft insecticides, biocontrol
Greenhouse whitefly, <i>Trialeurodes vaporariorum</i>	Beans	Oils, soaps, biocontrol
Tomato yellow leaf curl virus (TYLCV)	Tomatoes, tobacco	Vector management, tolerant varieties
Potato tuberworm, <i>Phthorimaea operculella</i>	Potatoes	NPV virus, sanitation, pheromone traps, action thresholds, soft pesticides
Sweet potato weevil (Piogan), <i>Cylas formicarius</i>	Sweet potatoes	Pheromone traps, destruction of crop remains and infested materials
Citrus weevil, <i>Diaprepes abbreviatus</i>	Citrus crops	Biocontrol
Diamondback moth, <i>Plutella xylostella</i>	Cabbage, other cruciferous crops	Biocontrol, pheromone traps

Tomato fruit worm, <i>Heliothis</i> spp.	Tomatoes	Pheromone traps; BT (microbial insecticides)
Avocado lace bug, <i>Pseudacysta perseae</i>	Avocado	Oils
Recent arrivals: brown aphid, <i>Toxoptera citricidus</i> ; leaf miner, <i>Phyllocnistis citrella</i>	Citrus crops	Biocontrol

## 5.2 Training and Technology Transfer

Approximately 70% of project resources have been devoted to training and extension activities. Extension has been provided to beneficiary farmers through field days, demonstration plots, technical assistance activities, and through validation research carried out in farmers' fields. Training activities have included informal talks, seminars, and workshops. The extension and training activities have often blended into one another, as training sessions have tended to be designed to both heighten awareness of the IPM approach and of the adverse impacts of excessive pesticide use, as well as to transfer practical pest management techniques. These activities have been highly successful in encouraging the farmers' understanding and adoption of IPM practices in target areas.

During the initial stages of project implementation (1991-92), the project staff had to work very hard at overcoming farmers mistrust, skepticism, and even hostility, all of which were directed both toward the IPM team, as well as to the IPM concepts and practices recommended (see table 4). Initial training focused on pesticide management, principles and applications of IPM, and crop-specific pest and pesticide management techniques. An IPM news bulletin was developed and distributed three times per year, with a circulation of 1,000 copies. Once exposed to the alternatives offered by IPM techniques, many farmers and agronomists became enthusiastic project supporters and accepted the IPM approach to crop protection. Furthermore, many producer organizations, as well as individual farmers, utilized the project as an outlet for venting, discussing, and finally seeking rational solutions to what seemed to be, until then, unmanageable crop protection problems. This project's efforts at promoting the adoption of a pest management approach that relies far less on pesticide use than the traditional, pesticide-oriented crop protection practices is getting wide recognition from both the agricultural community and the public sector (appendix 2).

Table 4. Training and awareness activities presented by IPM project during 1991-92

Kind of event	No. events	No. Indiv.	Kind of beneficiaries
Short courses	13	365	Agronomists and extensionists
Short courses	12	281	Producers

Short course	1	150	Teachers
Talks	18	309	Agronomists and extensionists
Seminars	51	1,331	Producers
Seminars	40	940	Agronomists and extensionists
Workshops	10	400	Producers, agronomists, and extensionists
Field days	13	650	Producers and agronomists
Total events	158	4,426	

The project has also generated a wealth of IPM information over the past three years, most of which is in the form of technical reports concerning the results of its various research and transfer activities. The essential information in these reports needs to be selectively extracted and used to develop practical technical bulletins, field guides, and similar extension tools for use by farmers, agronomists, and even students. However, the present responsibilities and heavy workload of the IPM team have not provided the time necessary to develop such materials.

### 5.3 Legal Measures

One of the more potentially effective pest management techniques identified and implemented by the project, in collaboration with SEA and local authorities, against whitefly-virus problems is a mandatory three month crop free period (veda) for known virus hosts (tomatoes and tobacco) and sweet potato whitefly hosts, such as beans, cucurbits, potatoes, and egg plant. Alternative crops, such as maize, guandul, onions, peanuts, sweet potato, manioc, carrots, and beets are being promoted by the government as substitute crops during such period. Implementation of the "veda" has been largely successful, reaching approximately 90% voluntary or involuntary (illegal crops are plowed under by government officials) compliance in all major tomato growing areas of the DR at the time of this evaluation. In these same areas, some 10% of tomato farmers fail to comply and escape detection by planting in remote or inaccessible areas.

The veda is also seen by project staff as a means to reduce whitefly populations before the bean crop is planted. The concern here is that, if such measures are not taken, this staple food crop may soon begin to experience severe whitefly damage. Whitefly attacks on beans and potatoes may be increasing, and the "veda" is being used to help lower whitefly populations before beans are planted to minimize their impact on this crop. The three month veda is partially designed to coincide with planting dates for beans.

A major drawback of having IPM project extensionists involved in the actual "veda" enforcement activities is that this could foster animosity toward the project among some

farmers, especially when the suggested alternative crops have been found to be unpractical. Some farmers interviewed during this evaluation have expressed that without government assistance in crop production and marketing for suggested alternative crops -- promised but not delivered -- farming such crops is not economical.

#### **5.4 Support for IPM Project in the Agribusiness Community**

The agribusiness sector support for the IPM project is generally very high. During its relatively short life, the project has gained widespread acceptance, credibility, and respect in each of the four regions where it operates as evidenced by interviews and meetings held with individual farmers, representatives of farmers associations, and agronomists and other technical advisors in the employment of producers organizations. Strong expressions of support come from both the organized tomato, citrus, and tobacco agroindustry, as well as from individual small and medium beneficiary producers of fresh market tomatoes, potatoes, sweet potatoes, cabbage and other vegetable crops, and avocados. The IPM project is openly credited by farmers with helping them save crop production costs through substantial pesticide reductions and offering hope for dealing with present and future pest problems in an organized and rational manner. Most farmers interviewed seem to identify with the project and its objectives and to view its staff as allies who are looking after the farmers interests. At least two independent fresh market tomato farmers, although fully acknowledging project contributions to local crop protection problems, insisted that its efforts were insufficient to stop virus attacks that led to almost total crop loss or when dealing with "veda" related issues, such as the farming of uneconomical substitute crops. As is often the case, the acceptance and adoption of IPM is driven by economic concerns. If a new agronomic approach is seen by farmers as economically beneficial, because it increases yield or quality, lowers production costs, or reduces pest damage, it will be adopted in some form or another. IPM techniques introduced by the project offers both reduced pest damage and savings in expensive pesticide applications. Even if the project were to end immediately, some of the techniques already transferred would remain an integral part of the farmers' crop protection operations.

#### **5.5 Project Linkages and Collaborative Arrangements**

Over the past four years, the IPM project has developed a robust network of collaborative arrangements with a wide range of national and international institutions and programs, including universities, research centers, private sector organizations, and public sector programs. At the national level, the project is jointly implemented by JAD, the Secretaría de Estado de Agricultura (SEA), and the Fundación de Desarrollo Agropecuario (FDA). All field activities are implemented by SEA personnel, in collaboration with other JAD crop protection specialists. Project activities, at the national level, are defined by JAD, SEA, and FDA. The project has also established collaborative relationships with research and training centers, such as the Instituto de Formación Técnico Profesional (INFOTEP), the Instituto Superior de Agricultura (ISA), the Instituto Agronómico Salesiano (IAS), the Universidad Autónoma de Santo Domingo (UASD); several developmental and conservation NGOs, such as Mujeres en Desarrollo (MUDE), Federación de Campesinos de Ocoa, Pronatura, Sociedad Ecológica del Cibao, and others; and numerous agroindustry and farmers organizations, including the Consorcio Citrícola del Este, Transagrícola, S.A., Asociación

Dominicana de Bananeros, Asociación de Agricultores del Valle de Constanza, the Núcleo de Parceleros de San Juan de la Maguana, and the Asociación Fabricantes de Conservas del Agro (AFCONAGRO). At the international level, the project is collaborating with the University of Florida, the International Potato Center (CIP) in Perú, and the Tropical Agricultural Research and Training Center (CATIE) in Costa Rica, U.S. Peace Corps, and the Inter-American Institute for Cooperation in Agriculture (IICA). A more exhaustive list of project linkages is shown in Appendix 3.

In general, the project provides training to most national organizations involved in some way in crop protection technical assistance and/or training, such as SEA, INFOTEP, and various agricultural schools. The relationship of the project with local NGOs, such as MUDE, Pronatura, and small farmers associations, has been mostly one of providing IPM training and technical assistance to their members. Validation research is implemented in collaboration with universities, such as UASD and ISA and farmers organizations, such as Transagrícola and citrus farmer associations. The enactment and enforcement of crop-free periods has been accomplished in collaboration with the tomato agroindustry associations and SEA. International research centers, such as CIP and CATIE, have provided research guidance and training for project staff. All these linkages are generally mutually beneficial for both collaborators and project, as all support the development and adoption of IPM. Farmers benefit directly by having more effective pest management tools; the project benefits because such arrangements facilitate the implementation of their activities and the achievement of their objectives; and collaborating universities and research institutions benefit through exposure to the unique pest problem conditions in the DR and the project's approach to IPM implementation.

## 5.6 Project Impact on Women and Women's Participation in Project Activities

Insofar as women are an integral part of the agricultural community, they benefit from the positive environmental and health impact that the IPM project has had on traditional pesticide use practices. Although the agricultural sector in the Dominican Republic is run almost entirely by men, women profit indirectly by sharing in the benefits of improved pesticide use, less residues, and the pesticide use savings resulting from IPM adoption. For instance, the Association of Agricultural Producers at San Juan de La Maguana is comprised of 180 members of which only 4 (2%) are women. On the other hand, women make a substantial proportion of the work force in vegetable and flower producing farms, which require more involved handling and packing procedures. For example, a 21 ha farm at La Vega that specializes in Chinese vegetables employs 50 persons, of which about 50% are women. In Jarabacoa, a 6.5 ha farm that produces fresh market tomatoes averages 100 workers/day, of which 60% are women. Another farm in Jarabacoa, dedicated to the production of flowers, employs 200 workers, of which about 70% are women. All such three farms receive occasional technical assistance in IPM by the project coordinator based at La Vega.

The project employs 14 staff members, all of which are male. This is partially a reflection of the fact that in the Dominican Republic only 1-2% of the work force in the agricultural technical fields are women. On the other hand, the project could recruit female

personnel with background in the social sciences, who after being trained in the basics of IPM and pesticide management, should be able to help the project expand its outreach program, concentrating more on female farmers.

In Constanza, the project provides training and technical assistance in pesticide use safety and IPM to the local, 25 member chapter of the Asociación de Mujeres de Acción y Progreso (AMAP) which functions with guidance and support from MUDE. IPM training emphasizes the need to reduce pesticide applications to reduce crop production costs and encourage natural control by beneficial organism, and the need to improve pesticide container disposal and the handling of contaminated laundry.

## 5.7 Project Impact on the Rural Poor and its Contribution to Poverty Alleviation

In the Dominican Republic, as well as in other developing countries, it is the more affluent or better organized farmers who tend to benefit more readily from a project such as IPM. Such farmers tend to be better educated and often have access to qualified agronomists, or are themselves agronomists, and therefore can quickly adopt or test any new promising technology, such as IPM. In contrast, the smaller, poorly organized farmers are individually less likely to be exposed to such technologies or to adopt them if there is a perceived element of risk in doing so. In three of its regions, the IPM project works mainly with organized farmers, partially because with its limited human resources, it must rely on such organizations to disseminate, in a multiplicative fashion, IPM technology and in part because their support is needed for the very existence of the project. In contrast, the project's North-Central Region office and its subregional center in Constanza works mainly with individual farmers, partially because there are fewer farmer organizations in the La Vega and Constanza valleys localities. All four regions, however, include small farmers in their programs.

Indirectly, the project's remarkable gains in fostering IPM adoption benefits the poor in several ways. Small farmers and field workers benefit from the decreased emphasis on pesticide use and increase awareness of the health risks associated with inappropriate and excessive pesticide use, all of which generate a hidden economic cost. The project's contribution to the adoption of more cost/effective crop protection techniques and to the reduction of potential pest damage benefits crop production and all those associated with its target commodities, including all those whose livelihood depend on or is related in some way to such commodities.

As designed, this project has not targeted specific groups of farmers, but major pest and pesticide use problems affecting specific commodities. Farmers who produce such commodities and, to a lesser extent, those individuals who indirectly benefit from the production of such commodities would benefit from more effective, cheaper, and more environmentally-sound pest management approaches. The project strives for a balance between its assistance to both large and small farmers in order to achieve a uniform impact. A greater dedication to independent small farmers would require far greater human and financial resources than this project has at present. The role of this project should be limited to finding answers to pest and pesticide problems and foster their adoption to the extent possible; while reaching large numbers of farmers should be the responsibility of the public

sector extension system.

## 5.8 Impact of IPM Project in the Environment in Target Areas

Although there is no baseline data against which to measure this project's environmental impacts, much of it must be inferred from its numerous achievements over the past three years. Its main contribution in this area has been to create awareness of the consequences of excessive reliance on pesticide use and to introduce IPM techniques that emphasize the use of nonchemical pest control practices and the use of action thresholds to guide pesticide applications.

In a country where there is a surprisingly wide selection of pesticides of all kinds available to farmers, with little or no guidance for their use, this project has introduced in its areas of influence a better understanding of the proper role of pesticides in agriculture. The average number of pesticide applications in its target crops has been sharply reduced, and many of the conventional organosynthetic pesticides have been replaced by "softer" pesticides, such as oils, soaps, and microbials. As a consequence of decreased pesticide use, the pests' natural enemies (parasites, predators, and pathogens) will have a better chance to survive and recolonize depopulated areas, thus contributing to the natural control of insect pests. For instance, in the Constanza valley, where an intense form of agriculture which has traditionally relied heavily on pesticide use is practiced, white egrets are returning and beneficial insects are often common, even abundant.

## 5.9 Project Inputs

According to JAD, the total counterpart contributions to the IPM project to date amount to: RD \$7,245,343, of which RD \$5,064,794 and RD \$2,180,549 are contributed by the private sector and by SEA, respectively.

Examples of private sector contributions to the project include the support provided by JAD's diagnostic laboratory entomologist Abraham Abud and plant pathologist Julio Borbón, whose salaries are paid by JAD. These specialists function as informal members of the IPM team, providing assistance in their areas of expertise in research, training and extension activities, as well as in various administrative and coordination aspects of project implementation.

Another example is the support provided by Transagrícola, S.A. to the virus transmission research project, which is conducted by ISA in collaboration with the IPM project. This contribution alone amounts to about RD \$1 million. Transagrícola has also financed several workshops and validation research activities. The private sector also finances most activities related to the "veda," including training and awareness programs, as well as all expenses related to enforcement activities, including fuel and fees for the enforcement "brigades" that oversee compliance and plow-under illegal crops, when necessary. In Hato Mayor, the citrus producers have financed IPM training activities and have supplied all the equipment and materials that are used in the project's biocontrol lab in this region. Office space for the regional project units is provided by the Instituto Agrícola

Saleciano in La Vega, by the Instituto Superior de Agricultura in Santiago, and by the Instituto de Investigación de Zonas Aridas, in Azua. Virtually all research is conducted in farmers fields, where beneficiary farmers contribute land plots and all the required crop production and protection costs.

FDA contributions include the funding of overseas specialized training for project staff, in-country pesticide management training for project staff by EAP (El Zamorano) specialists, and the project evaluation conducted by CATIE specialists in 1991, as well as validation research and farmer training activities.

SEA's contributions include the project staff's salaries and up to three vehicles.

Once AID's financial support for this project ends, JAD will probably keep a small IPM unit, probably no more than six individuals, who would be available to provide IPM technical assistance services to farmers upon request, for a fee. This service would function in a manner similar to the services provided by JAD's laboratory diagnostic services. Its success would depend on the agroindustry demand, and -- without a marketing study -- the outcome is uncertain. Most farmers in Latin America, especially the small and less organized ones, are accustomed to receiving any available extension services at no cost from their respective ministry of agriculture. For instance, attempts at securing financial support for IPM implementation from farmers has had very little success in Central America. On the other hand, the larger and better organized producers in the DR, such as the tomato and citrus agroindustries would probably continue supporting limited IPM activities, as long as these are focused on those particular commodities in the respective producing regions.

## 6.0 Recommendations for Follow Up Actions

- Project Continuation: Those organizations funding the IPM project at present are urged to extend their support for another five years.

In spite of the significant achievements of this project, much remains to be done to expand the adoption of IPM practices and further minimize pesticide misuse. The Dominican Republic is continually facing invasions by exotic pest species, and some of those already established continue to be a potential risk. There is still a great deal of pesticide overuse throughout the country, especially in those locations which the project has not yet reached. Through trial and error, the project has developed an effective IPM transfer mechanism and strong relationships with many farmers. Much of this system would most likely collapse if present U.S. support were to end, as there are no contingency plans at present to keep the project in its current form in the absence of such support. Some activities would probably continue with the support of the agroindustry and some farmer organizations, but such activities would probably be crop-specific and highly localized. This project's present and potential contributions to the economy, environment, and health in rural areas make it a highly valuable asset to the Dominican Republic. It is not necessary that the project have a presence in each agricultural region in the country, but should continue to concentrate its activities in major food crop producing areas. Because of its limited resources, it would be preferable that the project not overextend itself and that it continue to concentrate its efforts

in selected sites, where the likelihood of attaining measurable impacts is greater. At the end of its second phase, the project should become sustainable (see below) and basic IPM approaches should have become adopted by at least 75% of producers of target crops in each of the regions where the project is active.

The remaining recommendations are directed to any possible second phase of this project.

- **The project should become sustainable at the end of its second phase.**

If extended, the project should develop a workable sustainability strategy from the inception of its second phase. As recommended by Chiri (1992), such strategy may include plans for charging fees for services rendered, such as training, technical assistance, field diagnostic services, and -- on a selective basis -- pesticide testing. It may consider producing and marketing biocontrol agents with proven effectiveness under local conditions, as well as IPM publications, training, and extension materials. As a local source of IPM expertise, it could provide technical assistance to projects financed by USAID and other donors. Eventually, it could diversify into areas such as organic farming, soil management and irrigation, pest management for livestock and other domestic animals, and agroforestry.

- **The project should be highly selective in defining its research program.**

The project has limited resources and must select its work load and objectives with care. The project is often pressured by success-motivated farmers that strive to do too much. Locally influential producers also demand, on occasion, special project attention in areas not consistent with main project objectives. In the future, the project should concentrate its efforts on previously selected research objectives, avoiding -- to the extent possible -- activities that may detract from project objectives. Project efforts devoted to research should not exceed 15-20% of its resources. The project should, whenever possible, collaborate with institutions having research capabilities, such as universities and research centers, if undertaking medium or long-term research. Its current emphasis on validation research should continue. It should update and readjust its objectives periodically, relative to the evolving status of crop/pest relationships. Long-term research should be left to institutions having the mandate, infrastructure, stability, long-term commitments, qualified personnel, and overall research capabilities. One way to help define project research objectives would be by categorizing potential work into high and low priority; and long-term and short-term objectives:

High priority (key pests of major crops), long-term research (e.g. breeding for plant tolerance to virus) should be conducted by universities and research centers with some project collaboration.

High priority (key pests of major crops), short-term research (e.g. testing for available, potentially effective pesticides or biocontrol agents) which lead to rather quick results should be conducted mainly by project staff, with some assistance from other institutions.

Low priority (key pests of minor crops and potential or occasional pests of a major crop), long-term (e.g. population biology and biocontrol a minor pest) research should elicit little or no project intervention. Any research at this level should be conducted by universities and research centers.

Low priority, short-term ("fire-fighting" response to a minor, but locally severe, pest problem as requested by farmers) may trigger project response, if relatively rapid and useful results can be anticipated, within the required time frames.

This selection strategy is summarized in the following table:

Pest problem	Long-term research	Short-term research
Key pests of major crops	Other programs/institutions. Some project involvement.	Mainly IPM project + other programs/institutions.
Minor/occasional pests	Little or no project involvement.	IPM project responds selectively.

- Extension and training activities should continue to dominate project efforts

This is the area where the project has had the greatest impact. In its present form, the project structure and team composition is highly suited to the very activities that have made this project successful. At least 70-75% of project resources should continue to be devoted to these and related activities, including the generation of extension and training materials. In addition, the project should design an outreach strategy targeting women in the rural and agricultural communities. The role of women in crop production, agroprocessing, and safety at home should be analyzed and incorporated into such a strategy.

- The project should have the assistance of a document specialist to facilitate increase of publications output

Current output of project publications is at a fairly low level. Some of it, usually reports or research and other project activities, are still in draft form. During a second phase, the project needs to increase the output of extension and training materials, but should not hurry the process just to respond to outside pressures. First, the project needs to develop a publication strategy based on perceived needs and target audiences. Examples of useful materials that could be produced are: farmer and extensionist-oriented, crop-specific IPM manuals; technical bulletins, including periodic updates of status of major pest and pesticide use problems; materials for use in schools and universities; simple field guides for the more common pests and their natural enemies; and more posters and similar materials. However, as presently constituted, the project is at near maximum capacity dealing with field problems and will need additional personnel to boost its publications output. The project should have access to the services of a document specialist to facilitate this activity and should devote up to 10% of its efforts to this end.

- **Women-Oriented Activities**

Any extension of the project should expand its outreach efforts in pest/pesticide management to women groups and audiences. The training and technical assistance activity pioneered in the North-Central region with AMAP/MUDE is a good example of what the project can do in this area (see section 5.6) and should be replicated at each of the project regions. Likewise, the project should direct some of its planned pesticide management publications to women and their role in safe pesticide storage and use, both in the field as well as at home. Special emphasis should be made on the health risks associated with the inappropriate disposal of pesticide containers, the utilization of these containers for other purposes, and on the potential impacts on women and their families. Other issues of concern include laundering of pesticide-contaminated clothing; inappropriate pesticide storage, often close to home and in structures which are not secured under lock and key; and potential health concerns associated with long-term exposure to low levels of pesticide residues in food. JAD should also make an effort to recruit female technical staff, with experience in reaching women producers or women involved in any way with the agroindustry, when replacing any extensionist who may choose to leave the project or if project activities expand to other regions.

- **The project should expand its pesticide management and safety training program and add to its staff a qualified specialist**

The project should increase its pesticide management/safety training and awareness activities in the more pesticide-exposed areas, such as the Constanza valley. The basics of pesticide use safety is rather generic and applies to agricultural chemical control in general. The project could dramatically increase its impact in this area by including in its team a pesticide management specialist solely dedicated to creating and implementing a country-wide pesticide management training program for farmers, field workers, rural families, women, extensionists, and pesticide vendors. Local input will be needed to identify and reach key household members to ensure the proper targeting of project messages. Through this individual, the project could collect and distribute safe pesticide use posters and awareness materials from organizations such as EPA, the Panamerican Agricultural School (EAP), GIFAP, FAO, and WHO. This individual would also function as the project's pesticide specialist, relative to current U.S. EPA and FDA pesticide regulations and import requirements, pesticide toxicology, and management in general.

- **The project should distance itself from regulatory and enforcement functions**

Until now, the project has been directly involved in the enforcement of government-mandated crop free periods against crops known to be hosts of whiteflies and TYLCV virus. This often requires the destruction of commercial fields grown in violation of the "veda". Involvement in regulatory activities is bound to elicit some resentment against the project among those farmers affected. In addition, such activities detract from other project activities. The project should be perceived as a resource and problem-solving entity, not as an enforcer. Enforcement of crop-free periods should be left to local authorities, such as SEA's regional director.

- Before the start of its second phase, the project should hold informative and planning workshops

Before completing its first phase, the project should organize a national two day IPM workshop to present to wide audience project accomplishments to date, invite scrutiny and constructive criticism and ideas from interested participants, obtain inputs from project staff and specialists outside the project to adjust and fine-tune the project objectives for the next five years, encourage collaboration and linkages with IPM specialists and groups both within and outside the DR, and reinforce the interest and support from the agroindustry and the public sector communities. This first workshop would mainly be informative and promotional, and would be designed to gain perspectives for interested communities.

Following the informative workshop, the project should hold a 4-5 day planning workshop to re-examine and fine-tune its priorities and objectives, including current research and extension objectives; target and crop/pest systems; proportion of project efforts assigned to research, extension, training, and publication activities; and strategies for strengthening its linkages with national and international crop protection institutions and programs. This workshop would be a starting point for developing good strategies in a collaborative and participatory way.

- Any second phase for this project should include a mid-term evaluation to assess project accomplishments and deal in a timely fashion with any significant implementation problems that may have arisen during its first two years.
- Current project management and accountability arrangement should be maintained in the next phase

Thus far, the project has functioned remarkably well. Current project arrangements, which call for the close interaction between JAD, FDA, and SEA, as well as close monitoring by AID, have allowed for a reasonably efficient project implementation. It is recommended that similar arrangements be maintained in any future extension of this project, including retaining a monitoring mechanism similar to AID's, as well as similar accountability requirements.

Any planned extension of this project should consider and analyze vehicle suitability in reference to project needs and should include a separate line item for maintenance, distinct from the fuel line item. It is a common error to assume that pick-up type vehicles are best suitable for use in a crop protection project. Actually, the most common and important commodities transported in such vehicles are people, not field equipment. Vehicle suitability to local road conditions should also be carefully considered. The smaller, more maneuverable vehicles are better suited to local roads. Unleaded gasoline is often unavailable in remote areas, and the fuel injector of project cars has been damaged in the past when project staff have been forced to use leaded gasoline. The budget for any future extension of this project should, furthermore, include a line item for vehicle maintenance and repair. This extension-oriented project relies heavily on transportation, and it must be assured reliable vehicles to facilitate its activities.

- **IPM training and adequate compensation for project staff should continue**

Although this project has assigned about 60% of efforts to research, few of its staff are trained crop protection specialists. Almost four years of exposure to IPM field work, short-term training, and visiting specialists has undoubtedly helped to build up their expertise. None the less, the need for further training in specialized IPM areas remains, and any future extension of this project should include provisions for continuing staff training in recognized IPM centers, such as CATIE, EAP, and numerous U.S. universities. In addition, in-country workshops for project staff should be held periodically, using both local and international specialists. Training should average at least one, preferable two weeks/year/person. Training topics should be selected on the basis of individual needs and the nature of IPM research and transfer objectives. For instance, at present the project is extensively using pheromone traps against several insect pests, yet none of the project staff has had training in the rather complex areas of ethological control or insect chemical communication. The design of a second phase should include the analysis of training needs and the formulation of a training plan for project staff, as well as the necessary funding to accomplish such training. Examples of specialized training areas are: sampling and economic thresholds, biological control techniques, the use of microbial pesticides, plant virology, immature insects, taxonomy of natural enemies, the use of pheromones and related behavioral insect management techniques, and pesticide toxicology.

The basic monthly salary of most project staff is about DR \$3,000 - 3,500, which is far below salaries paid by the private sector for comparable work. For this reason, the project has a policy which compensates each staff member with an additional RD\$2,500 from project funds. Without the additional compensation, this currently authorized salary level would eventually work against the project by hindering its capacity to retain its qualified staff. Any extension of this project should consider mechanisms through which salary levels in the project can continue to be adjusted to match those in the private sector. In addition, an evaluation system linked to annual increases and based on individual performance, professional skills, and motivation should be developed for the project staff. Failure to address these issues may lead to the gradual loss of the best-qualified and experienced staff and a decrease in the overall project effectiveness having a serious impact on sustainability and capacity over time.

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# **IMPACTO ECONOMICO DEL PROYECTO MANEJO INTEGRADO DE PLAGAS**

**Jesús de los Santos**

## **Introducción**

El uso de plaguicidas es la práctica de control de plagas predominante en la producción agrícola. Los plaguicidas de origen químico llegaron a constituirse en un instrumento importante para la agricultura ya que contribuyeron a disminuir pérdidas ocasionadas por plagas en los cultivos. Si bien el uso de plaguicidas ha contribuido a mejorar los niveles de producción y rentabilidad "económica" de los cultivos también su uso indiscriminado ha causado perturbaciones graves a los ecosistemas y en la salud del hombre y paradójicamente en algunos países ha aumentando los costos de producción y reducido la rentabilidad de los cultivos.

El uso inadecuado de plaguicidas ha provocado el desarrollo de resistencia de las plagas a los plaguicidas; reducción de las poblaciones de enemigos naturales de las plagas; acción residual de plaguicidas en los cultivos y en los alimentos; y eliminación o reducción de especies de importancia económica y/o ecológica. (French, 1989).

Esta situación se ha presentado en la República Dominicana donde el uso inadecuado de plaguicidas se ha manifestado en severos ataques de plagas reduciendo grandemente la producción de cultivos comerciales importantes y consecuentemente se ha traducido en pérdidas de millones de pesos, reducción de exportaciones, pérdidas de empleos y aumento en las importaciones de plaguicidas.

Este uso excesivo de plaguicidas ha creado la necesidad de evaluar tecnologías utilizadas en el control de plagas y considerar métodos alternativos de combate que garanticen un nivel adecuado de rentabilidad a la vez que se reduce el uso de plaguicidas. El Manejo Integrado de Plagas (MIP) ofrece una alternativa al uso de plaguicidas por ser un enfoque ecológico y multi-disciplinario que promueve al máximo el uso de factores de mortalidad natural y cuando sea necesario, en aplicación selectiva de químicos.

En este Trabajo se presenta un evaluación económica del programa Manejo Integrado de Plagas (MIP) ejecutado por la Junta Agroempresarial Dominicana (JAD) conjuntamente con la Secretaría de Estado de Agricultura (SEA) y la Fundación de Desarrollo Agropecuario (FDA). En una primera parte se presentan los antecedentes del programa. Luego se describe brevemente las actividades del programa. En una tercera parte se hace un análisis del impacto de este programa sobre los cultivos donde se han enfocado las actividades del MIP. En la última parte se presentan algunas conclusiones y recomendaciones para el programa MIP.

## I. Antecedentes del Programa Manejo Integrado de Plagas

Aunque en el país existían problemas de plagas en varios cultivos, es en a finales de la década de los 70's cuando empieza a manifestarse con mayor magnitud en cultivos comerciales. La Mosca Blanca de Invernadero *Trialeurodes vaporarium* fue identificada en el valle de Constanza en el año 1978 reportándose ataques significativos a cultivos comerciales en el año siguiente. Una segunda mosca, *Bemisia tabaci*, la Mosca Blanca del algodón, apareció en melones, tomates, cebollas y otros cultivos en las zonas agrícolas más importantes del país. En el caso del tomate industrial en el Valle de Azua la aparición de esta plaga ha afectado severamente la producción desde 1988 hasta prácticamente eliminar la producción de este cultivo en la zafra 1992/1993 (Gómez, 1992).

Se argumenta que las causas del ataque severo de esta plaga en el Valle de Azua se debe al uso inadecuado de insecticidas por parte de los pequeños productores de tomate industrial de la zona, así como la aplicación preventiva y excesiva recomendada por las procesadoras de tomate y exportadoras radicadas en el Valle. Esto se ha agravado por la ausencia de alternativas de producción atractivas para los productores de estos productos. Se aplicaban una amplia variedad de químicos en un esfuerzo por asegurar ganancias adecuadas en base a las inversiones iniciales relativamente altas de los cultivos orientados para el procesamiento o para las exportaciones. Esta tecnología se volvió ineficiente contra ciertas plagas a medida que los insectos desarrollaban resistencia a un amplio rango de pesticidas, o a medida que los químicos afectaron las poblaciones de beneficios, permitiendo por tanto que se desarrollaran plagas secundarias además, de las plagas principales.

Para enfrentar esta problemática el gobierno a través de la SEA promulgó una resolución (17-89) prohibiendo la siembra de tomate y otros cultivos que se consideraban hospederos de la mosca blanca por el período que va desde el 1ro. de mayo al 1ro. de septiembre. A pesar de que la resolución se comenzó a aplicar en el 1989, no fue efectiva debido a que los gerentes de las empresas productoras y los productores no estaban conscientes del valor de la aplicación de la resolución. Es por eso que en el año siguiente el ataque de mosquita blanca fue más severo. Esto afectó no sólo a la producción de tomates, sino a cultivos de exportación como los vegetales chinos y tomate de ensalada.

Conjuntamente con la mosca blanca hizo aparición el *Thrips palmi* en las regiones de La Vega, Santiago y la Línea Noroeste y ha aparecido en el Valle de Azua y otras zonas productoras del país. La aparición de esta plaga ha afectando tanto los niveles de producción como los niveles de exportación. esto se manifestó cuando en 1988 y a comienzos de 1989 varios embarques de productores dominicanos fueron confiscados a su llegada a los Estados Unidos debido a infestaciones con *T. palmi*. En 1989 el sistema de Inspección Fitosanitaria del Departamento de Agricultura de los Estados Unidos (USDA-APHIS) detuvo la entrada de vegetales chinos a ese país debido a la infestación por este trípido afectando considerablemente los niveles de exportación. Las pérdidas estimadas por el efecto combinado de los rechazos por plagas y residuos y los daños por plagas en vegetales chinos durante 1989 se fijaron en US\$35 millones (Escarramán, 1989). La industria de flores orientadas hacia la exportación también se ha visto afectada por este *Thrips* y por otros del género *franklinella*.

## **II. Origen del Programa Nacional Manejo Integrado de Plagas (MIP)**

El programa MIP constituye un esfuerzo conjunto de la Secretaría de Estado de Agricultura (SEA), la Fundación de Desarrollo Agropecuario (FDA) y la Junta Agroempresarial Dominicana (JAD), cuyo objetivo es proveer una respuesta rápida y efectiva a la crisis inmediata de los plaguicidas, y construir la base organizacional y experiencia necesarias para una estrategia nacional de manejo integrado de plagas, permanente y sostenido (Proyecto MIP, 1989).

Este proyecto está conformado por el Consejo Nacional de Manejo Integrado de Plagas, que incluye participación del sector público y los agroempresarios. En la parte de ejecución se dispone de un Gerente

General en la Sede Central y cuatro Gerentes Regionales ubicados en las cuatro Oficinas Regionales. Cada una de estas oficinas cuenta con un Consejo Regional de asesoría.

### III. Actividades del Programa MIP

Los programas de validación de tecnologías, programas de capacitación a técnicos y productores y la supervisión para el cumplimiento de la resolución de la SEA han sido la principales actividades del Programa MIP.

Las actividades de validación se han desarrollado en dos cultivos principalmente tomate y repollo. En las Regionales Norte-Noroeste y Sur-Suroeste se ha trabajado con tomate y en la Norcentral en el cultivo de repollo. Este concepto consiste en la utilización de técnicas de manejo integrado de plagas que han sido desarrolladas mediante investigación en otros países del área y también en la República Dominicana y comparadas con las prácticas convencionales utilizadas por los productores.

En la regional Norte-Noroeste se instalaron trabajos de validación en el cultivo de tomate industrial en parcelas de los productores en la zona de mayor producción de tomate industrial en el Valle del Cibao. Además, se han establecido trabajos en los cultivos de habichuelas rojas y vainitas chinas.

Además, se ha estado trabajando en el control de plagas en el cultivo de papa y batata en la Región Norte, específicamente en la Zona de Constanza y la provincia Espaillat. En estos cultivos se han estado utilizando feromonas para el control del gusano minador de la papa *Pithorimaca* y el Piogán de la batata, *Cylas formicarius*, L.

En las regionales del MIP se ha llevado a cabo un programa de capacitación a técnicos y productores sobre manejo racional de plagas y plaguicidas. Con estas actividades se busca concientizar sobre el uso correcto de los plaguicidas y la utilidad de las demás prácticas de control de plagas en las que se destacaron el uso de insectos benéficos, el uso de prácticas culturales y las aplicaciones de insecticidas en base a monitoreo periódicos de insectos.

Conjuntamente el MIP realiza una serie de actividades orientadas a la destrucción de rastrojos post-cosecha, sobre todo en los cultivos considerados hospederos preferidos de la mosca blanca *Bemisia tabaci*,

(Genn.) y otras plagas cuyo manejo ha resultado difícil con los métodos convencionales de aplicación de plaguicidas.

El proyecto también incluye días de campo con productores y agroempresarios de la región para la demostración de la aplicación de prácticas de manejo integrado de plagas. Estos encuentros se realizan con los sectores público y privado de la región quienes se han mostrado muy receptivo a la puesta en ejecución de este proyecto, mediante la creación de mecanismos de apoyo a los productores.

#### IV. Importancia de los Cultivos donde se ha estado Trabajando en Manejo Integrado de Plagas (MIP).

El cultivo de tomate representa el cultivo principal para la zona del Valle de Azua donde cerca de 4,000 productores en una extensión promedio de 35 tareas tienen como actividad principal la producción de tomate. El valor de la producción anual de tomate era de unos RD\$90 millones durante el período 1980-1988 antes de la incidencia de la mosquita blanca. Así mismo, durante ese mismo período se produjeron melones y vegetales chinos para exportación por un valor de US\$6.0 millones al año.

El área sembrada de tomate industrial se redujo de 135,000 tareas en 1988 a apenas 53,783 en 1991. De igual manera la producción ha descendido de 1.77 millones de quintales en 1988 a unos 1.13 millones de quintales en 1991 (ver cuadro 1).

Cuadro 1. Área Sembrada y Producción de Los Cultivos donde se han Utilizado Manejo Integrado de Plagas, 1988-1992

Cultivo	1988		1989		1990		1991		1992		1993	
	Área Sembrada (tareas)	Producción										
Tomate	135,362.00	1,775,000	107,019.00	2,890,00	67,503.00	2,447,00	53,785.00	1,431,00	77,555.50	2,094,00	62,506.00	1,698,00
Papa	29,806.60	669,00	46,857.00	783,60	35,517.00	670,94	42,578.00	853,22	43,441.14	774,45	36,026.00	431,22
Batata	104,631.00	536,00	98,260.00	844,00	26,475.00	700,00	142,300.00	891,00	174,014.77	1,413,10	110,972.00	686,71
Repollo	658		7,077,00		8,032,00		11,973,00		5,152,00		N.D.	N.D.

Fuente: Planes Operativos, SEA.

La incidencia de la mosquita blanca se ha reflejado en un aumento en los niveles de importación de pastas de tomate debido a que las

empresas no pudieron producir suficiente tomate para la elaboración de pasta para satisfacer la demanda interna. Mientras en 1985 el país era autosuficiente en la producción de tomate industrial con posibilidades de exportar, cinco años más tarde (1992) se importaron unos 2,817 toneladas métricas por un valor de US\$2.17 millones. Para 1993 las importaciones fueron de US\$12.4 millones (cuadro 2).

**Cuadro No 2.Exportaciones e Importaciones de Pasta de Tomates,1983-1993 (en toneladas métricas)**

Años	Exportaciones (TM)	Importaciones (TM)
1983	2.04	0
1984	1,739.68	0
1985	427.64	0
1986	310.09	122.36
1987	285.77	3,986.55
1988	0	3,309.82
1989	2	955.18
1990		
1991		
1992		2,817.00
1993		15,127.00

Fuente:1984-1991, INESPRE  
1992-1993, AFGONÁGRO

El cultivo de la batata se produce en todas las áreas agrícolas del país y es considerado como un cultivo de subsistencia que ha adquirido importancia como un cultivo de exportación no tradicional. La producción promedio durante el periodo 1988-1992 ha sido de 990,000 quintales en una área de 120,000 tareas. Las exportaciones de este cultivo para 1992 fueron por un valor de US\$1.4 millones (cuadro 3).

El repollo es un cultivo cuya producción está localizada en el valle de Contanza. Unas 5,300 tareas están dedicadas a la producción de repollo con una producción anual de 12.3 millones de unidades (cuadro 1).

## V. El Programa MIP y la Rentabilidad de la Producción

Independientemente de los métodos de control de plagas que un productor agrícola desee implementar, el factor más importante que debe

considerar es el económico. Esto significa que las ganancias económicas de la producción, deben ser mayores a los costos de reducir el daño causado por las plagas. Se ha establecido que los agricultores hacen uso económicamente eficiente de los insumos (especialmente plaguicidas) tomando en consideración la inversión de capital hecha en el cultivo hasta el momento de empezar a utilizar estos insumos (Hernández 1988).

**Cuadro 3. Valor de las Exportaciones Agropecuarias no Tradicionales, 1978-1987 (En miles de RD\$)**

Productos	1983	1984	1991	1992
<b>RAICES Y TUBERCULOS</b>	<b>7.132,4</b>	<b>9.321,8</b>		
Batata	1.383,9	1.706,9	1.694	1.645
<b>LEGUMBRES Y HORTALIZAS</b>	<b>9.098,9</b>	<b>12.211,2</b>		
Ajies y Pimientos	978,8	1.643,2	483	678
Vainitas	1.219,5	1.362,9	213	453
Tomates	203,2	298,4	375	476
Papas	67,0	640,7	7	95
<b>PRODUCTOAS VARIOS</b>	<b>4.915,7</b>	<b>4.915,7</b>		
Flores Frescas	352,9	532,1	2.492	2.014

Fuente: CEDOPEX, Boletín estadísticos, varias ediciones

Debido a que una mayoría de los productores depende en gran parte de la cosecha para generar los ingresos para su familia, estos son renuentes a aceptar cualquier tipo de innovación que pueda poner en juego su nivel de subsistencia. Además, los plaguicidas han sido vendido como la panacea para el control de las plagas y enfermedades y se ha estado usando en el caso de cultivos comerciales de forma preventiva. Esto significa que el productor prefiere no arriesgar su cosecha y esperar a que se detecte la existencia de la plaga debido que el mercado es cada vez más exigente en la presentación y calidad del producto. Esta exigencias hacen que el agricultor vea sus niveles de rentabilidad y producción en el corto plazo sin hacer referencia a la contaminación y degradación del medio ambiente. Por tal razón no se debe ver la conducta del productor como una conducta irracional, sino que responde a una función objetivo de maximización de ganancias o de optimizar el flujo de ingresos de cualquier actividad económica o de preservar un nivel mínimo de ingresos.

En el caso de productos de alto nivel comercial como los vegetales (tomate, repollo, melón, vainitas chinas), la aplicación de pesticidas oportuno o de irrigación por ejemplo, puede marcar la diferencia entre una buena cosecha y un desastre. Debido a que los productores han estado utilizando una tecnología por toda una generación y en el caso de los que usan pesticidas en exceso, con cierto nivel de rentabilidad es difícil convencerlo de lo atractivo de cambiar a un nuevo sistema de producción. Eso se hace evidente en la producción de repollo y tomate industrial que son cultivos de alto valor comercial y donde los productores generan ingresos muy superiores a los ingresos generados por unidad de tierra en otros cultivos alternativos.

El control cultural que se ha estado introduciendo a través del MIP es de naturaleza preventiva, tiene efecto extendido, implica muy poco o ningún aumento en los costos normales de producción, siendo en muchos casos una práctica de propósitos múltiples. Las modificaciones ambientales generadas representan en su mayoría algún cambio en las prácticas agrónomicas.

En la medida que se pueda demostrar que las prácticas recomendadas tienden a reducir el nivel de aplicación de plaguicidas y a reducir los costos de producción y se traduzca en mayores beneficios para los productores sin que necesariamente se aumenten los riesgos de perder la cosecha, en esa medida el nivel de adopción de las mismas aumentará.

## VI. Impacto Económico del Programa MIP

Para medir el impacto de las alternativas introducidas por el proyecto MIP sobre el nivel de uso de fungicidas e insecticidas es importante analizar la estructura de costos en la producción de los cultivos donde se ha estado trabajando. En los anexos 1,2 y 3 se presentan los costos de producción para el tomate industrial, la batata y el repollo respectivamente haciendo uso de la tecnología convencional para 1993. Estos costos se obtuvieron mediante discusión con las diferentes agroindustrias y el costo real de varios productores. En los cuadros 4, 5, y 6 se presentan la estructura de costos de los insumos usados en la producción de estos cultivos.

Para el caso del tomate se puede observar que del total de los insumos, los insecticidas representan un 53.7% mientras que los fungicidas son responsables por un 16.7%. Ambos representan un 70% del costo total de los insumos. Por tal razón, una reducción en el uso de estos dos insumos tiene un impacto significativo en el costo de producción del tomate industrial.

**Cuadro 4. estructura de los Costos de Insumos en el Tomate Industrial.  
(Tecnología convencional versus Alternativa MIP)**

	MIP	-Porciento- Convencional	MIP
<b>COSTO TOTAL DE INSUMOS</b>	<b>823,85</b>	<b>653,21</b>	<b>100,00</b>
Semillas	36,44	36,44	4,42
Insecticidas (*)	356,09	238,091	43,22
Fungicidas (*)	138,23	85,589	16,78
Fertilizantes (*)	146,17	146,17	17,74
Herbicidas (*)	45,9	45,9	5,57
Uso de Agua (*)	101,02	101,02	12,26
			<b>15,47</b>

(\*) incluye costo de aplicación  
Fuente: costos de producción

**NOTA:** Con el uso de la tecnología sugerida por el MIP se produce una reducción en la cantidad y el número de aplicaciones de insecticidas y fungicidas. Esto se traduce en una reducción de un 40% en los costos de estos dos insumos y un 28% de los costos de los insumos. El costo total de producir una tarea de tomate industrial se reduce en un 14%.

Con el uso generalizado de las recomendaciones del MIP, se produce un ahorro de RD\$ 15-17 millones por cada cosecha de tomate realizada.

**Cuadro 5. Estructura de los Costos de Insumos en la Batata, 1993  
(tecnología convencional versus Alternativa MIP)**

	-en RD%/área)- Convencional	MIP	-porciento- Convencional	MIP
<b>CONSUMO TOTAL DE INSUMOS</b>	<b>50,79</b>	<b>45,45</b>	<b>100,00</b>	<b>100,00</b>
Semillas	16,84	16,84	33,16	37,05
Insecticidas	23,36	14,02	45,99	30,84
Fungicidas	0,00	0,00	0,00	0,00
Fertilizantes	0,00	0,00	0,00	0,00
Herbicidas	0,00	0,00	0,00	0,00
Uso de Agua	10,59	10,59	20,85	23,30
Feromonas	0,00	4,00	0,00	8,80

Fuente: Calculado en base a los costos de producción.

**Nota.** Con el uso de la tecnología sugerida por el MIP se produce una reducción en la cantidad y el número de aplicaciones de insecticidas. Esto se traduce en una reducción de un 40% en los costos de estos dos insumos y un 28% de los costos de los insumos. El costo total de producir una tarea de batata se reduce en un 14%. Con el uso generalizado de las recomendaciones del MIP, se produce un ahorro de RS\$ 15-17 millones por cada cosecha de batata realizada.

**Cuadro 6. Estructura de los Costos de Repollo  
(Tecnología Convencional versus Alternativa MIP)**

	-en RD\$- Convencional	MIP	-porciento- Convencional	MIP
<b>COSTO TOTAL DE INSUMOS</b>	127,02	992,94	100,00	100,00
Semillas	286,16	286,16	22,48	28,82
Insecticidas (*)	616,22	269,73	48,41	37,24
Fungicidas (*)	93,97	56,38	7,38	5,68
Fertilizante (*)	232,33	232,33	18,25	23,40
Herbicidas (*)	0,00	0,00	0,00	0,00
Uso de Agua (*)	44,34	44,34	3,48	4,47
Feromonas	0,00	4,00	0,00	0,40

(\*) incluye costo de aplicación

Fuente: costos de producción.

**Nota:** Con el uso de la tecnología sugerida por el MIP se produce una reducción en la cantidad y el número de aplicaciones de insecticidas y fungicidas. Esto se traduce en una reducción de un 40% en los costos de estos dos insumos y un 28% de los costos de los insumos. El costo total de producir una tarea de tomate industrial se reduce en un 14%.

Con el uso generalizado de las recomendaciones del MIP, se produce un ahorro de RD\$15-17 millones por cada cosecha de tomate realizada.

Con el uso de la tecnología sugerida por el MIP se produce una reducción en la cantidad del número de aplicaciones de fungicidas e insecticidas, esto se traduce en una reducción de un 40% en los costos de estos insumos y un 28% de los costos totales incurridos por uso de insumos (cuadro 4).

Con el uso generalizado de las recomendaciones del Proyecto MIP y asumiendo una área sembrada promedio en el período 1988-1992 se produce un ahorro de RD\$9-11 millones por cada cosecha de tomate realizada (cuadro 7).

Ha este impacto en el costo en la producción es importante agregar que la disminución en el uso de plaguicidas se traduce en ahorros de divisas en las importaciones de estos insumos. En el cuadro N°. se puede observar el aumento experimentado en el valor de las importaciones de plaguicidas durante el período 1981-1992. En efecto las importaciones fungicidas e insecticidas han aumentado de US\$4.38 millones en 1983 a US\$8.52 millones en 1991 (cuadro 8).

De manera similar, los insecticidas representan un 46% de los insumos utilizados en la producción de batata. Mediante el uso de feromo-

nas, se ha podido controlar el ataque del piogán y a la vez reducir la cantidad y el número de aplicaciones de insecticidas. El ahorro como consecuencia del uso de feromonas es de RD\$400,000- 500,000 por año (cuadro 7).

**Cuadro 7. Ahorro como resultado de la tecnología sugerida por el MIP**

Cultivo	Costo/area (RD\$)	Area Cosechada (areas)	Ahorro/area (RD\$)	Total Ahorro (*) (RD\$0,00)	Total Ahorro (**) (RD\$0,00)
Tomate Ind.	1.343,69	88.241,00	170,64	9.034,77	11.293,47
Batata	525,85	123.336,00	5,34	395,17	493,96
Repollo	1.936,34	7.016,00	280,06	1.178,94	1.473,68
Papa		39.615,00			
Total				10.608,88	13.261,10

(\*) se asume una tasa de adopción entre 60%

(\*\*) se asume una tasa de adopción de un 75%.

**Cuadro 8. Valor F.O.B. de las Importaciones de Pesticidas, 1981-1992**

AÑO	INSECTICIDAS	HERBICIDAS	FUNGICIDAS	VARIOS (**)	MATERIA PRIMA	TOTAL
1983	2.831,411	8.073,062	1.552,293	4432,718	503,971	13.403,455
1984	2.946,975	3.940,003	2.185,085	638,175	831,267	10.541,505
1985	2.959,398	3.853,778	1.919,109	455,474	1.101,880	10.289,639
1986	2.709,469	4.430,872	2.640,712	884,074	1.364,704	12.029,831
1987	3.336,922	5.767,842	2.462,419	1.108,300	2.721,334	15.396,817
1988 (*)	3.724,523	5.517,218	2.604,998	721,471	2.503,515	15.071,724
1989	3.984,227	9.287,926	3.402,264	980,328	2.333,401	19.988,146
1990(**)	4.214,449	7.961,286	2.646,071	600,218	2.603,188	18.025,212
1991	4.950,008	6.661,935	3.574,617	704,232	2.999,429	18.920,221
Promedio	3.517,487	6.165,991	2.554,174	2.554,174	1.884,743	14.851,839

\* Faltan las importaciones de septiembre de 1988 y abril de 1990

\*\* Reguladores Ph, materiales pegantes y fumigadores.

Fuente: Reporte mensual de las importaciones de pesticidas Secretaría de Estado de Agricultura

En el caso de repollo se produce un uso excesivo de insecticidas y fungicidas. Estos insumos representan un 55% del costo total de los insumos. El uso de feromona conjuntamente con las labores de moni-

toreos sugeridas por el programa MIP tiende a reducir el uso de estos insumos. En el cuadro 7 se puede observar que el ahorro como al utilizar la tecnología sugerida por el MIP en el cultivo de repollo es de RD\$1.17-1.4 millones.

En resumen, con las tecnologías validadas por el programa MIP los costos incurridos en insecticidas y fungicidas se reducen en RD\$10.6-13.2 millones ó US\$848,600- US\$1.06 millones. Viendo las importaciones de fungicidas y plaguicidas para el año 1991, esto representa una reducción entre 9% -12% de las importaciones de estos dos insumos.

## VII. Impactos Ambientales

Existen ejemplos sobre el daño para la salud humana y la productividad de la contaminación causada por el uso excesivo de plaguicidas. El uso de plaguicidas es un problema que incluye ciertas externalidades negativas donde el costo privado es menor que el costo para la sociedad. Esto hace necesario la intervención del gobierno para corregir estas fallas del mercado. En el caso del uso excesivo de plaguicidas y el ataque de la mosquita blanca el gobierno ha intervenido a través de las disposiciones controlando las épocas de siembra y prohibiendo el uso de algunos plaguicidas. Además, los productores han reaccionado impulsados por la pérdida de rentabilidad en sus cultivos. Esto ha ayudado a una mayor nivel de aceptación y adopción de las medidas sugeridas por el programa MIP. Esto así porque se ha podido demostrar que mediante la utilización de estas medidas se reducen los costos asociados con la aplicación de estos plaguicidas a la vez que como efecto social se reduce el nivel de contaminación y aumento de la calidad del agua y del aire. Este es un caso típico donde la reducción del uso de plaguicidas reduce las externalidades negativas.

Los productores que utilizan plaguicidas de forma excesiva no han cargado con todo el costo de recuperación. Sin embargo, ha sido la relación del programa con la Junta Agroempresarial Dominicana (JAD) lo que ha posibilitado una participación activa de los productores privados en el financiamiento de las actividades del MIP. Ha sido precisamente a través de su contribución al programa MIP que ha podido aportar parte de ese costo.

### **VIII. Distribución de los Beneficios**

Las actividades del MIP tienen un efecto re-distributivo bastante alto debido a que los cultivos en los cuales se ha trabajado existe una alta proporción de pequeños y medianos productores. En el caso del tomate unos 4,000 productores dependen de la producción de este rubro. De manera similar, los productores de batata en la región de La Vega son pequeños y medianos con una carga familiar de 6 miembros. Los productores de Repollo en Constanza poseen unidades de producción mas pequeñas aunque el tipo de producción es más intensivo y de un mayor valor comercial.

Los efectos distributivos del programa MIP son importantes debido a que un aumento en los ingresos pueden ser valiado mayormente por los pobres que por otros. Dependiendo de quien se beneficie se podrá concluir si se le puede dar apoyo adicional a este programa. Además, la reducción en el uso de plaguicidas se traduce en una reducción en el número de intoxicaciones y enfermedades en las zonas donde se aplican de manera excesiva de estos productos.

### **X. Conclusiones y Recomendaciones**

Existe consenso entre los productores y los agroprecesadores que es necesario la utilización de una alternativa tecnológica para enfrentar los problemas de las plagas y el uso excesivo de plaguicidas. Los problemas relacionados con residuos de plaguicidas han causado una disminución en cultivos específicos. Este uso excesivo es una amenaza para que los productores dominicanos puedan tener acceso y mantener los mercados internacionales. Esto también tendrá sus efectos sobre la capacidad del país para atraer capital y tecnología extranjera necesaria para el crecimiento del sector agropecuario y de la economía en general.

Las empresas que contratan la producción para el procesamiento como es el caso del tomate o del tabaco están en mejor posición para establecer un paquete tecnológico donde se haga uso adecuado de los plaguicidas y el uso de prácticas culturales apropiadas. En el caso del cultivo del repollo las exigencias del mercado para que se pueda consumir un producto con menos residuos químicos pondrá presión sobre los productores pero no será suficiente para que estos adopten métodos de control biológicos de forma masiva.

Las empresas distribuidoras de agroquímicos tienden a sentirse amenazadas por el programa de manejo de plagas debido a que esto

significaría una reducción en el nivel uso de los plaguicidas. Sin embargo, los plaguicidas tienden a perder su poder de control en un espacio de tiempo más corto debido a la resistencia que adquieren las plagas cuando se hace un uso inadecuado de los plaguicidas. Si se hace un análisis del uso de los mismos se podrá notar que precisamente durante las épocas de menor producción hay un mayor nivel de uso de dichos productos.

Es importante afianzar la aplicación de la resolución de la SEA e incluir cultivos asociados como alternativa de producción para los productores de la zona. Conjuntamente con esto es necesario el uso de feromonas como elemento de monitoreo y de control en algunas plagas. Esto así porque las feromonas ayudan a determinar el nivel de insectos presentes. Este uso de feromonas debe ir acompañado de la capacitación de los productores para la identificación de los insectos y determinar el momento de aplicación de insecticidas así como el uso de las trampas.

Es necesario además, la dotación de mayores recursos para este programa, que incluya una mayor remuneración para los técnicos del MIP así como un equipo mayor y multi-displinario para hacer más efectivo el proceso de adopción de las prácticas apropiadas del manejo integrado de plagas. Este equipo incluiría también evaluación socioeconómicas de las prácticas de manejo que puedan resultar atractivas para el productor en base a su retorno económico y no necesariamente a que es bueno desde el punto de vista ambiental. Además es necesario involucrar a las asociaciones de productores y a los agricultores líderes para que estos sirvan de "efecto demostración", entre los demás agricultores. Gran parte a la resistencia para adoptar prácticas de manejo integrado de plagas se debe a la pobre percepción de los retornos económicos que estas prácticas pueden resultar para el producto.

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**Anexo 1. Presupuesto Parcial para el Cultivo del Tomate industrial, enero  
1993**

<b>COSTOS VARIABLES DE PRODUCCION POR TAREA</b>					
Actividad-Servicios o Insumos	Mes	Cantidad	Unidad	Valor/Unidad	Costo (RDS)
<b>1. Insumos</b>					
.1 Semilla		0,1418	Libra	257,00	36,44
.2 Insecticida (Azorin 60)		0,7692	Litro	214,00	164,61
.3 Insecticida (Lannate)		0,5414	Libra	280,00	151,59
.4 Fungicida (Dithane M-45)		0,9833	Libra	100,00	98,33
.5 Fertilizante (16-20-0)		0,2786	Quintal	145,00	40,40
.6 Fertilizante (Urea)		0,2904	Quintal	175,00	50,82
.7 Fertilizante Foliar (Fertisol)		1,1455	Libra	13,75	15,75
.8 Herbicida (Fusilade)		0,0620	Litro	412,00	24,54
.9 Pago agua INDRHI (5 meses)		1,0000	Tarea	5,20	5,20
<b>2. Preparación del Terreno</b>					
.1 Corte (Mecanizado)		1,0000	Tarea	45,00	45,00
.2 Cruce (Mecanizado)		1,0000	Tarea	35,00	35,00
.3 Rastre (Mecanizado)		1,0000	Tarea	25,00	25,00
.4 Surque (Mecanizado)		1,0000	Tarea	20,00	20,00
.3. Siembra (Mecanizada)	I	1,0000	Tarea	30,00	30,00
.4. Riegos (2 Aplic.)		0,4344	Hom-Día	50,00	21,72
.5. Aplicación Herbicida (0,0620 Lt Fusilade)		0,4072	Hom-Día	50,00	20,36
.6. Riegos y Siembra	II	0,4524	Hom-Día	50,00	22,62
.7. Aporque (2 Aplic.)		0,4100	Hom-Día	50,00	20,50
.8. Desyerbo (Manual) (Despelúne)		0,5400	Hom-Día	50,00	27,00
.9. Aporque		0,4500	Hom-Día	50,00	23,00
.10. Aplicación Fertilizante (0,2786 QQ 16-20-0)		0,2880	Hom-Día	50,00	14,40
.11. Riegos (2 Aplic.)		0,4940	Hom-Día	50,00	24,70
.12. Desyerbos (2 Aplic.)	III	0,8932	Hom-Día	50,00	40,16

13. Aplicación Agroquímicos (0.2707 Lb. Lannate + 0.2863 Fertilisol)		0,2140	Hom-Día	50,00	10,70
14. Riegos (3 Aplic.)		0,4990	Hom-Día	50,00	24,70
15. Aplicación Agroquímicos (0.3115 Lt Azodrin + 0.2458 Lb + Ditahane + 0.2863 lb Fertilisol)		0,2880	Hom-Día	50,00	14,40
16. Aporque y Aplic. Fertilizante (0.2904 QQ Urea)	IV	0,4960	Hom-Día	50,00	24,80
17. Aplicación Agroquímicos (0.3115 Lt Azodrin + 0.2458 Lb Ditahane + 0.2863 Lb Fertilisol)		0,2460	Hom-Día	50,00	12,13
18. Riegos (3 Aplic.)		0,4940	Hom-Día	50,00	24,70
19. Aplicación Agroquímicos (0.3116 Lt Azodrin + 0.2458 Lb Ditahane + 0.2863 Lb Fertilisol)		0,4340	Hom-Día	50,00	21,70
20. Aplicación Agroquímicos (0.3116 Lt Azodrin + 0.2458 Lb Ditahane + 0.2863 Lb Fertilisol)		0,4140	Hom-Día	50,00	20,70
21. Cosecha (Varias)	V	1,0580	Hom-Día	50,00	52,90
SUBTOTAL					1.165,05
PAGO INTERES					155,34
GASTOS ADMINISTRATIVOS					23,30
TOTAL					1.343,69
I. semillero		0,00%	III Mano de Obra		36,74%
II. Preparación de Terreno		10,73%	IV Insumos		

Fuente: Administración Rural, SEA

**Anexo 2. Costos de Producción de la Batata, enero 1993**

COSTOS VARIABLES DE PRODUCCION POR TAREA					
Actividad-Servicios o Insumos	Mes	Cantidad	Unidad	Valor/Unidad	Costo (RDS)
<b>1. Insumos</b>					
1.1 Semillas (Hábanas)		-	-	-	-
2 Insecticida (Azodrin)		0,0921	Litro	214,00	19,71
3 Transporte Insumos		1,0000	Tarea	6,50	6,50
<b>2. Preparación del Terreno</b>					
1.1 Corte		1,0000	Tarea	45,00	45,00
2.1 Cruce		1,0000	Tarea	35,00	35,00
3 Rastre		1,0000	Tarea	25,00	25,00
4 Mureo y Surqueo		1,0000	Tarea	40,00	40,00
3. Picado de Hábanas y Siembra	I	0,7217	Hom-Día	50,00	36,09
4. Desyerbo		0,6467	Hom-Día	50,00	32,34
5. Aplicación Insecticida (0,0921 Lit Azodrin)	II	0,1200	Hom-Día	50,00	6,00
6. Desyerbo	III	0,6683	Hom-Día	50,00	33,42
7. Cosecha	V	1,1117	Hom-Día	50,00	55,59
<b>SUBTOTAL</b>					334,63
<b>PAGO INTERES</b>					44,62
<b>GASTOS ADMINISTRATIVOS</b>					6,69
<b>GASTOS SEGURO AGRICOLA</b>					
<b>TOTAL</b>					385,94
I. Semillero		III. Mano de Obra		163,42	48,84
II. Preparación de Terreno	43,33%	IV Insumos			

Fuente: Div. de Adm. Rural, Dpto. Economía Agropecuaria, SEA

# Reducen uso plaguicidas Constanza

28/3/93

Por Geraldino González

Constanza.— El uso de plaguicidas para lograr una buena producción agrícola ya sea de papa, batata, repollo, tomates y otros renglones alimenticios está siendo reducido sustancialmente por agricultores de esta y otras zonas del país mediante la aplicación de un programa de Manejo Integrado de Plagas (MIP) que ejecutan en coordinación varias instituciones.

La Junta Agroempresarial Dominicana, la secretaría de Agricultura y la Fundación Dominicana de Desarrollo Agropecuario han coordinado sus esfuerzos para lograr buena calidad, mayor cantidad sin que se deteriore el medio ambiente.

Porfirio Alvarez, gerente de la JAD explicó que en esta zona especialmente en los cultivos de papas y repollos se usan una especie de trampa que son colocadas en las plantaciones para eliminar las denominadas "Palomillas" que dañan la producción.

Explica que en laboratorios se logró crear la Feromona, una especie de sustancia sintética cuyo olor colocado en una trampa, hace que el macho de la palomilla se aproxime y quede atrapado en el lugar.

Añadió que con el programa de MIP se ha logrado casi la eliminación total del piogán de las batatas en otras zonas del país.

Agregó que con la implementación de este programa se disminuye el uso de agroquímicos, aumenta la productividad y se mejora la calidad del producto.

Dijo que en un total de 93 tareas que tiene el productor Dioris Rosario Espinal, hay unas 52 trampas, suficientes para controlar la plaga de la Palomilla.

El agrónomo Vincio Escarraman, gerente regional de la JAD en la zona explica que por ejemplo 20 productores de esta área no han hecho uso de pesticidas, disponen de riego por aspersión y tienen una producción de 10 a 12 quintales por tarea de papa.

El señor Rosario Espinal quien todo el tiempo ha vivido de la agricultura, dice que con la



aplicación de las trampas de Feromonas ha logrado una reducción en compra de agroquímicos de un 60 a un 70 por ciento.

Dijo que sería interesante que todos los productores de la zona se incorporaran a este proyecto como un mecanismo para eliminar la contaminación ambiental, y lograr una producción segura.

El señor Carlos Guerra fue el primer productor con quienes los ejecutores del MIP comensaron a laborar en el Valle de Tires, Constanza.

El señor Guerra tiene 17 años laborando la

tierra y ha cultivado papa, habichuelas, lechuga y zanahorias.

Se estima que alrededor de 20 productores están incorporado al MIP en esta zona y que actualmente están bajo ese proyecto unas 10 mil tareas de maíz.

Según los técnicos, las trampas de Feromona no sólo se aplican en las plantaciones sino que pueden ser colocadas en los almacenes lo que permite que muchos productos que están para semilla o para la venta puedan ser mantenidos en buen estado.

# Secretario Agricultura elogia programa del MIP

Discurso pronunciado por el secretario de Agricultura, acrónimo Tito Hernández, en el seminario internacional sobre Manejo Integrado de Plagas en el cultivo de batata, celebrado en el hotel El Embajador del 20 al 25 de este mes.

## Sofores y sefores:

Si bien el uso de plaguicidas ha contribuido a mejorar los niveles de producción y rentabilidad económica de los platos también su uso indiscriminado ha provocado el desarrollo de resistencia de las plagas a los plaguicidas, disminución de las poblaciones de enemigos naturales de plagas, efecto residual de plaguicidas en los cultivos y los alimentos, y eliminación o reducción de especies de importancia económica y ecológica.

La mosca blanca es probablemente el mejor ejemplo de los problemas de plagas y manejo de pesticidas que se han presentado.

Esta plaga ha afectado grandemente la producción de importantes cultivos, tales como melones y tomates, minando prácticamente la producción de estos cultivos.

La incidencia de mosquita blanca se ha reflejado en un aumento en los niveles de importación de pescados de más a más de 12 millones de dólares debido a que las empresas no pudieron producir suficiente tomate para la elaboración de pescado para satisfacer la demanda interna. El Trípala palmi ha afectado tanto los niveles de producción como los niveles de exportación en vegetales uno. La industria de flores orientales hacia la exportación también se ha visto afectada por el Trípala.

Este problema de plagas ha tenido importante incidencia en las comunidades y en la agricultura, como el caso del tomate el cual representa el cultivo principal para la zona del valle de Azua, donde hay cerca de 400 productores en una extensión promedio de 35 tareas un valor de más de 90 millones de pesos al año.

El cultivo de la batata se produce en unas 120 mil tareas en todo el país y ha adquirido importancia como un nuevo de exportación no tradicional con exportaciones más de un millón 800 mil dólares.

Para responder a este problema de la mosquita blanca, Trípala y muchas otras plagas que han estado afectando negativamente a nuestra agricultura, la secretaría de Estado de Agricultura, en un esfuerzo conjunto con la Unidad de Desarrollo Agropecuario (FDA) y la Junta gubernamental Dominicana (JAD), decidió implementar Programa Manejo Integrado de Plagas (MIP), con el objetivo de proveer una respuesta rápida y efectiva a la crisis inmediata de los pesticidas, y construir la base organizacional y la experiencia necesarias para una estrategia nacional de manejo integrado de plagas sostenible y sostenida.

Este programa ha permitido al país ahorros superiores los 50 millones de pesos durante los tres años de implementación de las medidas del programa.

En este sentido, la SEA ha estado trabajando decididamente para darle respuesta a los problemas generados por los ataques de plagas no sólo a través de promulgación de resoluciones, sino también integrando al MIP a técnicos calificados.

Estos han demostrado un alto nivel de entrega y compromiso con este programa, tanto en las actividades de verificación de resultados, así también integrando al MIP a técnicos calificados.

Esta dedicación se ha visto premiada con el reconocimiento internacional, pues desde centroamérica un verano dirigentes para observar las actividades se están realizando estos técnicos agrupados en el MIP.

Los beneficios del MIP se derivan de que con el uso de la tecnología, sugiere se produce una reducción en la cantidad del número de aplicaciones de fungicidas, insecticidas, lo que se traduce en una reducción de un 40 al 50% en los costos de estos insumos y un 20 por ciento de los costos totales incurridos por uso de insumos a los efectos como es el caso de la batata, el tomate al respecto.



Tito Hernández

A este impacto en el costo en la producción es importante agregar que la disminución en el uso de pesticidas se traduce en ahorros de divisas en las importaciones de estos insumos.

De hecho, las reducciones obtenidas en las importaciones de pesticidas ascienden entre un 9 y un 12 por ciento. Esto, obviamente refleja el impacto favorable del MIP.

En tal sentido, los éxitos del MIP nos permiten destacar que este programa es un ejemplo de la colaboración que se puede establecer entre el sector privado y el sector público para enfrentar problemas comunes.

El sector privado ha desempeñado un rol muy activo participando en las actividades del MIP y observando las resoluciones de la SEA, así como haciendo aportes financieros.

Es por eso que consideramos de suma importancia la relación estrecha entre las actividades del MIP y las empresas privadas.

En este sentido, reconocemos que la participación de

AD ha sido vital para el éxito de este programa, ya que es la relación del programa con la JAD, lo que ha posibilitado una participación activa de los productores privados en el financiamiento de las actividades del MIP.

Entendemos que sin la presencia de la JAD sería muy difícil darle continuidad a este programa.

Es por ese, finalmente, que queremos aprovechar la oportunidad de este importante seminario internacional de Manejo Integrado de Plagas en el cultivo de batata para indicar que esta secretaría de Estado de Agricultura se identifica plenamente con las actividades que está realizando la JAD para consolidar el programa de Manejo Integrado de Plagas y salud y respalda la iniciativa del Gobierno norteamericano de donar un total de 70 millones de pesos para crear un fondo permanente que será utilizado para financiar las actividades del MIP.

Este aporte será de mucha significación para asegurar la sostenibilidad y ampliación de las actividades del MIP a largo plazo, así como para el desarrollo de la agricultura dominicana.

Muchas Gracias

# Plagas afectan productos causan daños Constanza

Mercal 17 de  
Por Liliam Mateo  
EL SIGLO  
agosto 1997

Valle Tíreo, Constanza.-La "invasión" de numerosas plagas en productos como la papa, cebolla, ajo, remolacha, repollo y zanahoria de la Región Norcentral ha sido el factor fundamental para que los productores de esa zona dejaran de ganar el pasado año entre 100 y 150 millones de pesos.

La incapacidad de controlar estas plagas (moscas blanca y Thrips palma, áfidos entre otros) así la presencia de altas concentraciones de plaguicidas en los vegetales exportados disminuyó los volúmenes exportables de las diferentes especies de vegetales.

Antes de la aparición de las plagas en la zona existían ocho grandes empresas y otro número similar de pequeñas compañías, específicamente en La Vega dedicadas al mercado de exportación de vegetales. En la actualidad hay cuatro grandes y siete pequeñas, según informó el director nacional del Programa de Manejo de Plagas.

En lo referente a la situación social, una gran cantidad de familias aproximadamente 300 productores que dependían directamente de esos cultivos por causa de la plaga tuvieron que dedicarse a otras actividades como el motoconchó y zonas francas, entre otros.

La ciudad de La Vega y el Valle de Constanza (esta última con sus zonas de producción como Tíreo, El Valle, La Sabina, Palero, El Río, Las Auyamas y El Cercado) han sido víctimas de las

plagas lo que obligó a la Secretaría de Agricultura, la Junta Agroempresarial Dominicana y a la Fundación de Desarrollo Agropecuario a implementar el Programa Nacional de Manejo Integrado de Plagas (MIP) en los lugares citados.

El ingeniero Porfirio Alvarez, director nacional del MIP, informó que el uso inadecuado de los plaguicidas estaba provocando serios inconvenientes a los productores a la hora de ofertar sus productos al mercado.

Pero, destacó que con la aplicación del MIP en las distintas plantaciones, la gama de productos químicos utilizados por los productores ha variado en estos últimos cuatro años.

Relató que en los años 1988-91 fecha de aparición de las plagas mencionadas, los productores la enfrentaron utilizando el método tradicional más fácil que es aplicar productos químicos con un promedio de 12 aplicaciones en la mayoría de las especies de vegetales por ciclo y por cultivo, aplicando dosis elevadas y haciendo aplicaciones calendarizadas.

"Cuando el Programa MIP inició sus actividades técnicas en la zona, se produce un cambio de cultura agrícola en las áreas de plantación con el establecimiento de una amplia campaña de capacitación a técnicos y productores, uso de cultivos intercalados, labores continuas del suelo, monitoreo de las plagas antes de hacer sus aplicaciones y uso de productos específicos entre otras medidas" significó Porfirio Alvarez.

En la actualidad los productores han reducido en más de un 50 por ciento el número de aplicaciones, en los vegetales



Los cosecheros de Constanza han tratado de preservar sus productos combatiendo las plagas que afectan sus cultivos.

ya que sólo aplican agroquímicos cuando es necesario.

El experto agrícola dijo que el Programa MIP también ha tenido gran éxito en la Regional de La Vega y su gran impacto lo constituyen los productores de batata de las zonas de Cabuya y La Clio luego de la aplicación del programa en la Cuarenta, Villa Tapia, Salcedo y Bonao; donde aproximadamente 500 productores siembran 23,000 tareas anualmente. En el caso de la batata, informó que ésta es atacada por el piogán, picudo o Cydas Formicarius y sus daños pueden llegar hasta el 100 por ciento dependiendo del manejo de la plaga y el nivel de infectación de los tubérculos.

El funcionario de la JAD explicó que la Regional desde sus inicios puso en marcha un programa de MIP, con énfasis en el uso de feromonas sexual

para la captura de los especímenes machos disminuyendo los niveles de infectación y la intensidad de los daños.

Se logró de este modo que los productores obtengan cosechas completamente limpias, disminuyendo el número de aplicaciones de insecticidas de 3 que en promedio se realizan en este cultivo para el control de la plaga a 1 y en la mayoría de los casos a cero.

Lo mismo está ocurriendo con los cultivos de la yuca, las flores y el plátano y vegetales de exportación.

El director nacional del Programa de Manejo Integrado de Plagas destacó que el tipo de agroquímicos utilizado, la frecuencia de las aplicaciones la dosis, el análisis de estas variables ha traído como consecuencias un cambio en el sistema de manejo en diversas agroempresas que operan en la zona.

En la actualidad, se aplican productos biológicos y "no hay ningún tipo de problema para el consumo de estos productos en los mercados de la capital", significó el ingeniero Alvarez.

Durante un recorrido por numerosas plantaciones de los diferentes cultivos ya mencionados del Valle de Constanza los productores comunicaron que antes de conocer el MIP gastaban entre RD\$100.00 y RD\$200.00 por tareas en aplicación de plaguicidas y que ahora gastan de 300 a 400 pesos "no por el número de aplicaciones, sino por los altos costos de los agroquímicos".

Destacando que el número de aplicaciones ha disminuido y ya no tienen problemas con los residuos de plaguicidas en los productos que exportan hacia los Estados Unidos.

Según datos aportados por los productores nativos del Valle y los técnicos del JAD el costo de producción se ha reducido, en virtud de la disminución de las aplicaciones de insecticidas, ya que los productores se aherran entre RD\$1,00.00 y RD\$1,200.00 en cada aplicación que dejan de hacer porque no es necesario la misma.

Además, del director nacional del Programa de Manejo Integrado de Plagas, ingeniero Porfirio Alvarez, ofrecieron detalles el también ingeniero Vinicio Escarramán, gerente regional, Carl W. Castleton, director para el Caribe de la Región I del Área III del Departamento de Agricultura de los Estados Unidos y Daniel Lora, encargado de la aplicación de los trabajos técnicos en las zonas mencionadas.

## **RELACION DE INSTITUCIONES Y ORGANISMOS QUE COLABORAN CON EL PROGRAMA MANEJO INTEGRADO DE PLAGAS (MIP)**

1. Secretaría de Estado de Agricultura (SEA)
2. Instituto Agrario Dominicano (IAD)
3. Instituto Nacional de Recursos Hídricos (INDRHI)
4. Banco Agrícola de la República Dominicana
5. Juntas de Regantes
6. Proyecto Manejo de Aguas
7. Instituto de Formación Técnico Profesional (INFOTEC)
8. Instituto Dominicano de Tecnología (INDOTEC)
9. ENTRENA
10. Instituto de Desarrollo del Noroeste (INDENOR)
11. Instituto de Desarrollo del Suroeste (INDESUR)
12. Instituto Superior de Agricultura (ISA)
13. Instituto Agronómico Salesiano (IAS)
14. Misión Técnica China
15. Universidad Autónoma de Santo Domingo (UASD)
16. Federación Provincial de Organizaciones Campesinas, Inc. (FEPROCA)
17. Federación de Campesinos Mamá Tingó (FECANMAT)
18. Junta de Desarrollo de San José de Ocoa
19. Pronatura
20. Sociedad Ecológica del Cibao (SOECI)
21. Sociedad de Ecología Inc. (SODEI)
22. Grupo Habitat
23. Colegio Dominicano de Ingenieros y Arquitectos (CODIA)
24. Asociación Nacional de Profesionales Agrícolas (ANPA)
25. Mujeres en Desarrollo (MUDE)
26. Cuerpo de Paz
27. Federación de Campesinos de Ocoa (FECAO I)
28. FECAO II
29. Asociación Dominicana de Ingenieros Agrónomos (ADIA)
30. Asociación de Productores Agrícolas de San Juan de la Maguana
31. Núcleo de Parceleros de San Juan de la Maguana
32. Asociación San Antonio de San Juan de la Maguana
33. Consorcio Citrícola del Este

- Secretaría de Estado de Agricultura
- Junta Agroempresarial Dominicana
- Fundación de Desarrollo Agropecuario

**RELACION DE INSTITUCIONES Y ORGANISMOS QUE COLABORAN CON EL  
PROGRAMA MANEJO INTEGRADO DE PLAGAS (MIP)**

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34. Asociación Fabricantes de Conservas del Agro (AFCONAGRO)
35. Asociación Dominicana de Bananeros (ADOBANANO)
36. Cooperativa de productores y Exportadores de Aguacate
37. Centro Dominicano de Promoción y Exportaciones (CEDOPEX)
38. Dole Dominicana
39. Rainbow Farm (Melones)
40. Centro Internacional de la Papa (CIP)
41. Asociación de Ganaderos de Hato Mayor
42. Fundación de Desarrollo Agropecuario (FDA)
43. Oficina de APHIS en República Dominicana
44. Instituto Interamericano de Ciencias Agrícolas (IICA)
45. Asociación de Horticultores del Valle de Constanza
46. Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
47. Universidad de Florida.